HELMINTHOLOGICAL ABSTRACTS

A quarterly review of world literature on helminths and their vectors especially in relation to veterinary, medical and plant pathology, soil science, fisheries, fresh-water and marine zoology, taxonomy and geographical distribution.



Prepared by the

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The Bureau deals with the biology, systematics, diagnosis, pathology, treatment and control of helminths with special reference to forms parasitic in man and in domestic and wild animals, and to forms harmful to cultivated plants and related species occurring in soils or water. It also covers the biology of molluscan, arthropod and other vectors of helminth infections.

It scans the world literature for articles on helminthological subjects; abstracts those articles which appear to embody facts of importance in helminthology; and publishes the results of these activities in its quarterly journal.

From time to time the Bureau issues occasional publications of a non-periodical nature. These are of two kinds:

- (a) Technical Communications which embody the results of recent advances in a manner useful to research workers.
- (b) *Digests*, a new series of publications, in which it is proposed to present information concerning recent advances in the application of research to the practical treatment and control of helminthic diseases of man, domestic animals, fish, and crop plants in a manner useful to the medical man, the public health worker, the veterinarian, the fishery officer, the farmer and the nurseryman.

A special function of the Bureau is the identification of helminthological material, particularly specimens sent by overseas workers to whom local facilities are not available. For this purpose it maintains a Taxonomic Unit. It provides laboratory and library facilities and technical help to scientists of the Commonwealth countries who wish to continue or complete their helminthological investigations while visiting the United Kingdom.

In approved cases the Bureau also prepares bibliographies on helminthological subjects; answers queries on helminthological problems; supplies microfilm and photostat copies of helminthological articles to those without access to the originals; and acts as a liaison centre for putting helminthologists working on similar problems in different parts of the world in touch with each other.

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The Editor would be glad to receive reprints of helminthological articles as soon as possible after their issue in order that abstracts of them may be printed without delay.

Reports

Departmental and other reports in which helminthological matters are mentioned should be sent to the Editor as soon as they are published in order that prompt notice of them may appear in *Helminthological Abstracts*.

Books for Review

The Editor will be glad to receive for review books relating to any branch of helminthology. Volumes in which helminthological subjects form only a part of a cognate whole are as welcome as those devoted exclusively to helminthology. Publishers are reminded of the world-wide circulation of *Helminthological Abstracts* among workers in this field.

News Items

Readers are invited to submit to the Editor items of news likely to be of interest to helminthologists.

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Special order forms may be obtained from the Bureau.

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TAXONOMY UNIT

In view of the need for taxonomic and identification services in helminthology, a Taxonomy Unit has now been established within the Bureau. The services provided include:

- (a) Assistance in the identification of helminthological specimens in co-operation with specialists in the United Kingdom and other countries.
 - (b) Creation of reference collections available for exchange and distribution.
 - (c) Encouragement and assistance in local surveys.
- (d) Provision of laboratory and library facilities and technical help to scientists of the Commonwealth countries who wish to continue or complete their helminthological investigations while visiting the United Kingdom.
 - (e) The compilation of a modern authoritative work of reference.

Overseas workers to whom local facilities are not available are invited to submit their helminthological material for identification. Since badly fixed specimens are often unidentifiable, it is essential that all such specimens should be adequate in this respect. Advice on methods of fixation and preservation will be supplied on request.

ADVISORY SERVICE

The Bureau is always pleased to render an opinion or give assistance in connection with any helminthological matter submitted to it.

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T. C. 30a. "Supplement to the Nematode Parasites of Plants Catalogued under their Hosts. 1955–1958"

by J. Basil Goodey, Ph.D., Mary T. Franklin, Ph.D. and David J. Hooper 66 pp.

Price 7/6 (\$1.20)

T. C. 31. "Plants Recorded as Resistant to Root-Knot Nematodes (Meloidogyne spp.)"

by Mary T. Franklin, Ph.D. and David J. Hooper 33 pp. Price 7/6 (\$1.20)

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HELMINTHOLOGICAL ABSTRACTS

Vol. 29, Part 2

REVIEW ARTICLE

Recent Advances in Carbohydrate Biochemistry of Helminths

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Introduction

The numerous carbon atoms present in the carbohydrate molecule which are potentially oxidizable make it the preferred nutrient of endoparasites whose metabolism is characterized by fermentations both in the presence and absence of oxygen (Hungate, 1955). It is not surprising that publications dealing with the occurrence and utilization of carbohydrates in parasites are becoming increasingly numerous. A fairly complete summary of the literature published in 1952 (von Brand) quoted 122 papers on helminth carbohydrate biochemistry which had appeared between 1865 and 1951. The present review summarizes 115 relevant publications which have been published in the last eight years.

Distribution of Low Molecular Weight Carbohydrates

Recent studies have largely clarified questions concerning the quantity and nature of low molecular weight carbohydrates occurring in helminths. Advances have been made in determining the glucose concentration by application of a specific enzymatic method utilizing glucose oxidase in preference to rather non-specific chemical methods. The latter, which

depend on reducing properties of sugars, even when combined with yeast digestion, tend to give high values. This non-specificity, together with a somewhat doubtful isolation procedure, may explain why Daugherty & Taylor (1956, and "Errata" in Exper. Parasit., 6, 629, 1956) found "glucose" concentrations varying between 380 and 80 mg. per cent of the fresh weight in various regions of Hymenolepis diminuta, while Fairbairn (1958 b), employing the glucose oxidase method, found 190 mg. per cent glucose in the dried tissues of the same worm. This corresponds to about 40 mg. per cent of the living tissues. A finding by Fairbairn (1958 b) of special interest and one that should stimulate further research, is the observation that the glucose concentration of different species varies greatly. The extremes, in per cent of tissue solids, were 0.00 per cent (Taenia taeniaeformis) and 3.0 per cent (Moniliformis dubius). There can be little doubt that the glucose oxidase method will find increased use; it may therefore be worth while pointing out that it should be employed in conjunction with a total carbohydrate determination in order to avoid the possibly erroneous assumption of the absence of other sugars. While nothing comparable is as yet known from helminths, it should be remembered that fructose accounts for most of the fermentable blood sugar in the Gastrophilus larva (Levenbook, 1950).

Similarly, the complete reliance of previous workers on reducing methods prevented their finding the non-reducing disaccharide, trehalose, which Fairbairn (1958 a, b) reports is widely distributed in helminths and which occurs in amounts surpassing those of glucose in several species. While relatively little trehalose was found in several cestodes and in the fluke Fasciola hepatica, its concentration in nematodes varied between 0.06 per cent of the solids (Litomosoides carinii), and 2.18 per cent (larval Porrocaecum decipiens). Even higher concentrations occur in the acanthocephalan, Moniliformis dubius, 2.3 per cent, (Laurie, 1959) and in the haemolymph of Ascaris lumbricoides, 4 per cent. The highest value observed was 7.9 per cent of the solids in unembryonated, decoated eggs of Ascaris lumbricoides (Fairbairn & Passey, 1957). During embryonation (Passey & Fairbairn, 1957; Fairbairn, 1957) an initial decrease of both trehalose and glycogen content is followed by a gradual increase in these carbohydrates resulting in levels in embryonated eggs approximating the original ones. It is rather remarkable that in infective eggs trehalose was almost completely confined to the perivitelline fluid while glycogen was restricted to the embryo proper (Fairbairn & Passey, 1957). Adult Ascaris contained varying amounts of trehalose in all tissues studied by Fairbairn & Passey (1957): the haemolymph, male and female reproductive systems, the integument, muscles and, in lowest concentration, the intestine.

The significance of trehalose accumulation in helminths, as in many other invertebrates from protozoa to arthropods, (Fairbairn, 1958 b) is not too well understood at present. Fairbairn (1958 b) came to the tentative conclusion that this disaccharide "may either share certain aspects of energy metabolism with glucose, or substitute successfully for it".

Another interesting development involving a low molecular weight carbohydrate has been the identification in *Parascaris equorum* and *Ascaris lumbricoides* of a sugar that had not been observed previously in nature. It constitutes part of the ascarocides, structural lipids previously known as ascaryl alcohol. The carbohydrate moiety of the ascarocides has been the subject of a brilliant series of papers by Fouquey, Polonsky, & Lederer (1957, 1958, 1959), and Fouquey, Lederer, Lüderitz, Polonsky, Staub, Stirm, Tinelli & Westphal (1958). Given the name ascarylose, it is 3,6-dideoxy-L-arabinohexose (3,6-dideoxy-L-mannose), and is the optical antipode of tyvelose which occurs in the endotoxin of *Salmonella typhi*.

Distribution of Polysaccharides

The chemistry of helminth glycogen has received some attention in recent years. Harrap & Manners (1952) found pronounced differences between the molecular weights of *Ascaris* glycogen calculated from sedimentation-diffusion and light-scattering measurements. They considered their sample a highly polydisperse system and could isolate from it a small fraction with higher molecular weight (22.5×10^6) than that of the total sample (8.8×10^6) . More recently Orrell & Bueding (1958) found the surprisingly high minimal average molecular

weights of 6.0 to 20×10^7 for glycogen extracted with cold water from *Ascaris* muscle. Conventional extraction procedures (strong hydroxides or trichloracetic acid) lead to preparations with much smaller molecular weight.

The observation that helminth glycogen is a mixture of compounds varying considerably in molecular weight may be of immunological importance. Recent work has shown rather conclusively that carefully prepared glycogen samples, presumably free from protein contaminants, possess a variety of immunological properties. Heidelberger, Aisenberg & Hassid (1954) have shown that Ascaris glycogen precipitates anti-pneumococcal horse sera of various types, and Oliver-González (1953) has reported that Trichinella and Ascaris polysaccharides inhibit blood agglutinins.

A different type of heterogeneity of a helminth polysaccharide has been described by Monteoliva & Guevara (1958), who find that part of the polysaccharide of Ascaridia galli occurs as "free" glycogen, while part is bound to proteins. The latter fraction yielded only glucose on hydrolysis. Several protein-glycogen complexes, fundamentally similar but somewhat better characterized, have been isolated by Kent (1957 a, b), from Hymenolepis diminuta and Raillietina cesticillus. Another type of polysaccharide-containing protein is represented by the mucoid secretions of many cercariae (Kruidenier, 1953 a, b; Lewert & Lee, 1954) which have been studied histochemically but not chemically. Hydrolysis of free glycogen from Ascaridia galli yielded some mannose in addition to glucose. Whether this fraction was uniform, or a mixture of true glycogen with another polysaccharide is not clear. Non-glycogen polysaccharides have been described from other helminths. A protein-free antigenic polysaccharide toxic to rodents was isolated from the membranes of *Echinococcus* cysts by Cmelik (1952). It contained unidentified aldohexoses, glucosamine and deoxypentoses, and may be related to a polysaccharide found with glycogen in the scoleces of Echinococcus granulosus (Agosin, von Brand, Rivera & McMahon, 1957) which on hydrolysis yielded galactose and glucosamine. In the last case any antigenic property that may have been present would have been destroyed by the isolation procedure. Whether antigenic polysaccharides are related to the mucopolysaccharides demonstrated histochemically (Marzullo, Squadrini & Taparelli, 1957) in Echinococcus (and other cestodes), cannot be decided at present. In view of the wide distribution of specific polysaccharides in bacteria and apparently in protozoa as well, a more detailed search for such substances would appear justified in the case of helminths. It should be kept in mind that non-polysaccharide antigenic substances occurring in helminths may contain a carbohydrate component. Maekawa, Kitazawa & Kushibe (1954) purified and crystallized an antigenic substance from Fasciola hepatica which gave a positive Molisch test as well as positive ninhydrin and biuret reactions.

Glycogen has been recognized for many years as one of the most important energy sources of helminths, in particular those living in oxygen-poor habitats. During the period covered by this review, quantitative and qualitative data for representatives of all major helminth groups have become known. One of the more interesting findings is that trematodes of coldblooded hosts show pronounced differences in glycogen content. Odlaug (1955) found extremely low values (fraction of one per cent) in lung and bladder flukes of frogs, while Dawes & Muller (1957) report a considerably higher value (1.5 per cent of the fresh weight) for the lung fluke Haplometra cylindracea. The initially low glycogen content found in the metacercariae of Gynaecotyla adunca isolated from fiddler crabs, decreased to traces when the short-lived parasites developed in birds (Vernberg & Hunter, 1956). It is evident that in these cases no connection between oxygen content of the habitat and glycogen content of the parasites can be discerned. On the other hand, the flukes Gastrothylax crumenifer, Paramphistomum explanatum (Goil, 1957) and Fasciola hepatica (Mansour, 1959 a) living in the oxygen-poor stomach and bile-ducts respectively, stored very large amounts of glycogen. The same holds true for the intestinal acanthocephalans Macracanthorhynchus hirudinaceus (Ward, 1952) and Moniliformis dubius (Read & Rothman, 1958; Laurie, 1959).

Recent histochemical investigations of trematodes support the view that the main glycogen storage area is the parenchyma, although smaller amounts of polysaccharide also occur in other organs (Singh, 1956; Dawes & Muller, 1957; Bruskin, 1959).

A considerable amount of relevant research has been done with cestodes. Read reported in 1956 that Hymenolepis diminuta analysed in California contained nearly twice as much glycogen as those analysed in Texas. The worms had been raised in rats of different strains with host diet and caging differing. Subsequently Read and his co-workers (Read & Rothman, 1957 a, b, c; Read, Schiller & Phifer, 1958; Read & Phifer, 1959) reported detailed studies of the influence of dietary carbohydrates on Hymenolepis diminuta and other Hymenolepis species. Both quantity and quality of dietary carbohydrates proved important in controlling not only the glycogen level, but also worm size and egg production. For instance, Hymenolepis cannot utilize sucrose directly and is apparently unable to adapt itself to sucrose utilization even after the host has been kept on a high sucrose diet for some time. Worms in such hosts produce approximately half as many eggs as those from hosts on a starch diet. Fructose, like sucrose, is unavailable for direct utilization by these worms. When hosts receive a diet in which fructose is the sole carbohydrate very few eggs are produced and these differ in size from those formed by worms with access to a normal diet. The "crowding effect", that is the reduced average size of worms in cases of multiple infections, may also be related to insufficient dietary carbohydrate. This has been suggested by the similarity of the effect of multiple infections to the effects of quantitatively deficient starch diet, and qualitatively insufficient diets (sucrose). In nature tapeworms undoubtedly find many types of carbohydrates in their surroundings. It is remarkable that in most species studied the only sugar metabolized in addition to glucose is galactose, while other hexoses which many organisms utilize in preference to galactose are not utilized by cestodes. This preference for glucose and galactose was found in several cyclophyllidean species, one tetraphyllidean and one trypanorhynchid (Read, 1956; Laurie, 1957; Read & Rothman, 1958 a; Read, 1957, 1959). The only exception was an anoplocephalid (Cittotaenia sp.) which utilizes maltose and sucrose in addition to glucose and galactose (Read & Rothman, 1958 a).

Whether a polysaccharide gradient occurs in *Hymenolepis diminuta* is controversial. Read (1956) found considerably less glycogen in the anterior and posterior quarters than in the second and third quarters. Daugherty & Taylor (1956) who divided worms into 10 cm. lengths, found a high glycogen content near the scolex and lower amounts in the next 10 cm. In the remaining segments the glycogen content increased to form a short plateau and then decreased progressively. This discrepancy may result from nutritional differences since Daugherty & Taylor (1956) have reported that a 24-hour starvation period decreases the polysaccharide content of only the first two or three sections of the worms.

It is of interest that there is a non-uniform glycogen distribution in the larval stages of *Hymenolepis* species. By histochemical methods, Heyneman & Voge (1957) found most of the polysaccharide deposited in the scolex and tail, the concentration apparently increasing with growth and development of the larvae. A pronounced increase in histochemically demonstrable glycogen correlated to age had previously been described by Lewert & Lee (1955) for the larval stage of *Taenia taeniaeformis*.

Histochemical studies on adult *Hymenolepis diminuta* and *Raillietina cesticillus* (Hedrick & Daugherty, 1957), did not demonstrate the glycogen gradient which had been found chemically. In both cestodes the histochemical distribution of polysaccharides followed the pattern known in other species.

Host nutrition, although important, is not the only factor responsible for the glycogen level of tapeworms. Archer & Hopkins (1958) have shown that the glycogen content of the plerocercoids of *Diphyllobothrium* sp. is very high and constant as observed in other tissue parasites such as the plerocercoids of *Schistocephalus solidus*, (Hopkins, 1952), and the scoleces of *Echinococcus granulosus*, (von Brand, Agosin, Rivera, & McMahon, 1957). This is true for both small and large specimens; i.e. the glycogen content seems independent of age. However, during the 18- to 54-hour period after reaching the intestine of the final warmblooded host, the glycogen level abruptly declines to about half the larval value. During the 96- to 160-hour post-invasion period (worms immature) the polysaccharide value more than doubles and remains high after the worms become mature (although with pronounced and probably nutritionally induced variations). Another relevant observation is Daugherty's (1956) finding

that the rate of glycogen synthesis from glucose or pyruvate by *Hymenolepis diminuta* is lower in worms from castrated rats than in those from normal rats.

Newer quantitative data on glycogen in nematodes are in accord with the established fact that certain species store large amounts of polysaccharide. Fairbairn (1958 a) found 55 per cent glycogen in the dry substance of larval *Porrocaecum decipiens*, and von Brand (1957) found 6 per cent in fresh tissues of *Dioctophyme renale*, while smaller percentages have been reported from *Heterakis gallinae* (Glocklin & Fairbairn, 1952).

Polysaccharide distribution within various organs cannot be studied by quantitative methods in flatworms for anatomical reasons, but such determinations are possible in nematodes. The recent study by Fairbairn & Passey (1957) revealed that the glycogen content of muscles from males and females respectively is 13.6 and 15.4 per cent of the fresh weight. This corresponds roughly to 60 or 70 per cent of the dry weight, an unusually high value. The glycogen concentration in ovaries and uteri is respectively 7.6 and 2 per cent of the fresh tissue weight while in the male reproductive system, the haemolymph, intestine and integument, it is below 1 per cent.

Distribution of Structural Polysaccharides

The only well known structural polysaccharide of helminths is chitin, which has long been known to occur in the egg membranes of certain nematodes and acanthocephalans. Recently, Kreuzer (1953 a) isolated the chitinous membrane of *Ascaris lumbricoides* eggs, identified glucosamine and N-acetylglucosamine in acid hydrolysates and, in accordance with the findings of earlier workers, demonstrated the formation of chitosan by superheating the membranes with strong alkali. The last test was also positive for eggs of *Cruzia americana* (Crites, 1958).

It is possible that in some cases the chitinous egg membrane is not a uniform structure. Monné & Hönig (1954 a) reported optical studies indicating that in Heterakidae and Ascaridae chitin layers and protein lamellæ alternated to form the "chitinous shell". While the eggs of worms belonging to these groups contain easily demonstrable amounts of chitin, those of other nematodes, especially the Strongyloidea and *Echinuria uncinata* contain only traces (Monné & Hönig, 1954 a, and Monné, 1955). The same is apparently true for the acanthocephalans *Polymorphus botulus* and *P. minutus* (Monné & Hönig, 1954 b).

Other structural polysaccharides may occur in helminths, but the limited information now available does not prove the nature or function of these substances. Monné & Hönig (1954 c) demonstrated polysaccharide reactions in the polar plugs of the eggs of various Trichuris species and Chowdhury, Das Gupta, Ray & Bhaduri (1956) observed mucopolysaccharide in the basement membrane of the hexacanth embryo of Taenia saginata which cements the blocks of the embryophore. Whether a positive periodic acid-Schiff reaction, as given by the cuticle of Diplodiscus temperatus, (Singh, 1956), indicates the presence of a non-glycogen polysaccharide among its constituents is uncertain at present. The information available in these cases is confined to solubility characteristics or histochemical reactions and lacks chemical verification which now might be available with modern micromethods.

Carbohydrate Synthesis

Until recently little definite information was available concerning glycogen synthesis in helminths. This was due to the impossibility of keeping the worms alive and "normal" in carbohydrate-containing, bacteria-contaminated media. Application of aseptic surgical collection procedures, or sterilization of specimens with antibiotics can now eliminate the main difficulties.

One of the most extensive studies of carbohydrate synthesis has been reported by Cavier & Savel (1952) who reduced the glycogen content of *Ascaris lumbricoides* by two days' starvation prior to feeding potentially glycogenic substances. Significant glycogen formation was observed

from glucose, fructose, sorbose, maltose, and saccharose, but not from galactose, mannose, lactose, or sugar alcohols. Ligated ascarids did not form glycogen, indicating that carbohydrate absorption is confined to the intestinal mucosa. An interesting contrast is Mansour's (1959 a) observation that ligation does not hinder glycogen formation by Fasciola hepatica.

It may be significant that acid or alkaline phosphatases have been demonstrated histochemically in the cuticle or subcuticle of *Fasciola hepatica* (Yamao & Sato, 1952) and in other flukes (Yamao, 1952 a, b, and Dusanic, 1959). Phosphatase activity, detected in the intestinal wall of some flukes (Tarazona Vilas, 1958) is particularly evident in *Schistosoma mansoni* (Dusanic, 1959). Localization of the enzymes in the intestinal wall is characteristic of nematodes (Yamao, 1951 a, b, 1952 c), while in cestodes, where all nutritive material passes through the cuticle, strong phosphatase reactions are given by this structure (Lefevere, 1952; Erasmus, 1957 a, b; Tarazona Vilas, 1958). A strong alkaline phosphatase reaction has been observed in the cuticle of many species of acanthocephalans, although not in all those investigated (Bullock, 1958). Thus there appears to be some correlation between sites of phosphatase reaction and carbohydrate absorption, but it is at best presumptive evidence for causal connection.

Enzymatic hydrolysis of disaccharides and polysaccharides to simple sugars permits absorption and subsequent synthesis of glycogen. Cavier (1951) reported the presence of sucrase, maltase and an amylase, but the absence of lactase in the haemolymph of Ascaris lumbricoides, and Guevara & Monteoliva (1959) detected the presence of alpha-amylase in Ascaridia galli, while Lee (1958) found an amylase and maltase, but no lactase or invertase in the intestine of Leidynema appendiculata. Although it is not known whether helminths use glucogenic amino-acids for glycogen synthesis, Passey & Fairbairn (1957) have demonstrated the synthesis of glycogen and trehalose from lipids in Ascaris eggs during late embryonic development. In careful studies they excluded simple sugars, proteins, and non-protein nitrogenous substances as precursors, and excluded carbon dioxide fixation as the responsible mechanism. From the respiratory quotient and the relation between oxygen consumption and triglyceride disappearance these investigators drew the convincing conclusion that trehalose and glycogen were formed from triglycerides. This is the first time that such a conversion has been demonstrated in an animal, although it had often been sought. It may be pertinent to mention that Izumi (1953) described a morphological antagonism in the deposition of fat and glycogen during the development of Ascaris eggs.

It is usually assumed that the enzymatic synthesis of glycogen by helminth tissues follows the same pattern as demonstrated for vertebrate tissues. That is, glucose is assumed to be phosphorylated to glucose-6-phosphate in the presence of hexokinase, with phosphate donated by ATP. Phosphoglucomutase converts the Robinson ester to glucose-1-phosphate and this, in the presence of phosphorylase, forms a straight chain glucose polymer containing only 1,4 linkages. The synthesis is completed by a branching enzyme, responsible for the 1,6 linkages characteristic of glycogen. These linkages have been found in Ascaris glycogen (Bell & Manners, 1954). Evidence for the occurrence of the above sequence in helminths is largely circumstantial and incomplete. Hexokinases have been found repeatedly in various species, e.g. Schistosoma mansoni, (Bueding & MacKinnon, 1955), Ascaris lumbricoides, (Rathbone & Rees, 1954), and Trichinella spiralis larvae (Goldberg, 1958; Agosin & Aravena, 1959 a). ATP is probably widely distributed in helminths, evidence indicating its presence has been presented for Ascaris (Chin & Bueding, 1954) and some other nematode species (Jones, Swartzwelder & Abadie, 1955, 1957). Phosphorylase activity has been demonstrated only in tissues of Ascaris lumbricoides, (Cavier & Savel, 1953). Homogenates of intestine, body wall, ovaries and testes had significant rates of polysaccharide synthesis from added glucose-1-phosphate, with testicular tissue showing the least activity. So far, there is no report of attempts to isolate and purify either the phosphorylase or branching enzyme. In view of the enormous glycogen reserves often found and the rapid glycogen turnover in many helminths, such a study should be rewarding.

Investigation of the method by which helminths form the 1,1 linkages of trehalose and a detailed study of chitin formation are lacking. Chitin is unquestionably synthesized from reserve substances present in the oocyte, the carbohydrate moiety probably being derived

from glycogen or trehalose. Morphological observations dealing with the formation or potential precursors of the chitinous egg-shell in *Parascaris* and *Ascaris* have been presented by Fauré-Frémiet, Ebel & Colas (1954) and Yanagisawa (1955). *Moniliformis dubius* in vitro forms glycogen from glucose, fructose, mannose, and maltose, but these sugars do not lead to the formation of trehalose (Laurie, 1959).

Over-all Carbohydrate Metabolism

Recent studies of the over-all carbohydrate metabolism of helminths have confirmed and extended several previously reported observations. It has been shown that the rate of carbohydrate consumption is only slightly influenced by the presence or absence of oxygen or whether the carbohydrate is derived from exogenous or endogenous sources. This has been demonstrated for cestodes by Hopkins (1952) who studied Schistocephalus solidus, and by Agosin (1957) who studied the scoleces of Echinococcus granulosus. In the latter, glycogen consumption under aerobic conditions is 89 per cent of that under anaerobic conditions. Hymenolepis diminuta removes the same amount of glucose from the medium aerobically and anaerobically. However, since lactate production is reduced while polysaccharide synthesis is increased in aerobiosis as compared with anaerobiosis, Read (1956) concludes that the presence of air decreases carbohydrate metabolism. In trematodes Mansour (1959 a) found the aerobic glucose consumption of Fasciola hepatica reduced by 6 to 27 per cent below the anaerobic rate. For acanthocephalans, Ward (1952) has reported an aerobic glycogen consumption of 79 per cent of the anaerobic rate in the case of Macracanthorhynchus hirudinaceus, while the corresponding figure for the nematode Heterakis gallinae (Glocklin & Fairbairn, 1952) is 88 per cent.

In contrast to parasites, free-living invertebrates metabolize substantially more glycogen anaerobically than aerobically. The high rate of aerobic glycogen consumption of parasites is due to the occurrence of aerobic fermentation. The incomplete oxidations characteristic of aerobic fermentations are responsible for excretion of partially oxidized metabolic products and for utilization of more carbohydrate than would be predicted to occur under aerobic conditions. The actual rate of carbohydrate utilization varies with species, and is influenced by the physiological and, to a greater degree, the nutritional state of the parasites. According to Mansour (1959 a), in six hours one gramme of non-starved Fasciola hepatica in a nonnutritive medium consumed glycogen corresponding to about 92 micromoles of glucose, while flukes starved overnight metabolized only 18 micromoles under the same conditions. Starved and non-starved specimens showed no significant difference in amount of glucose consumed from a sugar-containing medium. Another important factor may be motility. Mansour (1959 b) reported that serotonin stimulated the undulating activities of liver-flukes and that the motility was accompanied by a significant rise in carbohydrate consumption, both from an extraneous source and from endogenous reserves. To what extent this finding can be generalized is not known. It should be remembered that motility in smaller animals requires proportionally less energy above the basal metabolic requirements than in larger organisms. What may apply to the relatively large liver-fluke may not be true for small flukes. Size as a factor in determining the rate of glycogen consumption has recently been mentioned by Goil (1957).

Another factor which unfortunately cannot be assessed for lack of data, may be energy supplied by various types of fermentations characteristic of different species.

Recent investigations support the well established fact that the carbohydrate metabolism of helminths is characterized by a great variety of metabolites. In cestodes, lactic acid is quantitatively the most important end-product of both anaerobic and aerobic fermentations, the latter generally yielding somewhat less lactate than the former. Lactate is the only metabolite identified in the case of *Hymenolepis diminuta* and *Oochoristica symmetrica* (Read, 1956). A detailed study of the scoleces of *Echinococcus granulosus* by Agosin (1957) has revealed a more complicated situation. While lactate was the major acid produced, smaller amounts of acetic and succinic acid were formed; about six times as much of the latter acid was excreted anaerobically as aerobically. Pyruvic acid, on the contrary, was encountered only among the

aerobic end-products. Of special interest is the excretion of ethyl alcohol both in the presence and absence of oxygen, since this is the first time that alcohol has been identified among the metabolic end-products of any helminth. Although Agosin (1957) employed a relatively non-specific bichromate oxidation procedure, his finding can be accepted as convincing since von Brand later (1959) detected ethyl alcohol in the larval *Taenia taeniaeformis* by means of a specific enzymatic method. In the acanthocephalan *Moniliformis dubius*, lactic, acetic, and formic acids have been identified as end-products of aerobic fermentations (Laurie, 1959).

In trematodes lactic acid probably plays a quantitatively less important role than in cestodes. It has been reported by Goil (1957) as an end-product of the carbohydrate metabolism of *Paramphistomum explanatum* and *Gastrothylax crumenifer*; however, he does not present quantitative data. Such figures have been given by Mansour (1959 a) for *Fasciola hepatica* and it is evident that lactate accounts for only a small percentage of the carbons of the consumed carbohydrate, propionic and acetic acids being the most conspicuous end-products. The relative importance of lactic acid was greater when the medium contained glucose than when the worms starved and increased more when the motility of the worms was stimulated by serotonin (Mansour, 1959 b). Mansour discounts the importance of higher fatty acids as metabolic end-products of the liver-fluke.

Several nematode species have been investigated during the period under consideration. Glocklin & Fairbairn (1952) and Fairbairn (1954) found that *Heterakis gallinae* produced mainly acetic and propionic acids with the latter predominating, and only small amounts of higher volatile acids, pyruvic and lactic acid. Another acid produced in significant amounts was probably succinic. The extensive carbon dioxide fixation during anaerobiosis was demonstrated as the chief source of the carboxyl atoms of propionic acid. Two-thirds of the fixed carbon dioxide appeared in the propionic acid, the remaining one-third in the acid tentatively identified as succinic acid. None appeared in acetic acid. Fairbairn (1954) considers it possible that under natural conditions *Heterakis* fixes metabolically produced carbon dioxide since its normal habitat seems deficient in this gas.

Another form studied rather intensively in recent years is the larva of Trichinella spiralis. Von Brand, Weinstein, Mehlman & Weinbach (1952) established that larvae kept axenically in non-nutrient media produced traces of lactic acid both aerobically and anaerobically but traces of a keto-acid only aerobically. The major end-products detected were volatile fatty acids, mainly acetic, n-valeric, and a non-characterized C6 acid. In homogenates a much greater amount of lactic acid is produced (Goldberg, 1958; Agosin & Aravena, 1959 a), although some C₂, C₅ and C₆ acids are also formed (Agosin & Aravena, 1959 a), pyruvate possibly serving as precursor of the latter. A fundamentally similar situation exists in Ascaris, which has long been known to produce little lactate when intact. In homogenates, the formation of fatty acids seems to stop completely, while relatively large amounts of lactic acid are formed (Bueding & Yale, 1951; Rathbone & Rees, 1954). This interesting shift in end-products indicates either that the enzymes leading from a common intermediate to fatty acids are more labile than those leading to lactate, or that a co-factor, essential for fatty acid production, has been excessively diluted. The C₅ acids excreted by intact Ascaris, α-methyl-butyric acid (Bueding & Yale, 1951), n-valeric acid, and tiglic acid (Bueding, 1953), are more complex than those excreted by Trichinella.

Acetoin, at first known only as a product of *Litomosoides carinii*, recently has been identified as a metabolic end-product of *Ascaris* (Yonesawa, 1953; Saz, Vitrine & Hubbard, 1958) and *Setaria*, but not of the microfilariae of *Wuchereria bancrofti*, (Yonesawa, 1953).

The universal occurrence of fermentations, especially aerobic fermentations, raises two interesting questions. The first concerns the mechanisms responsible for the inability to complete oxidations. In some parasites, such as *Ascaris*, the lack of certain key enzymes of the Krebs cycle may explain the excretion of partially oxidized metabolites. Other species, such as *Trichinella* larvae, seem to possess all of the terminal enzymes, but nevertheless excrete organic acids. It is necessary to assume that the enzymes forming these acids are more active than those metabolizing them. It is unknown whether quantitative insufficiencies or regulatory mechanisms are involved.

The second question concerns the universality of incomplete oxidations among parasitic helminths. The surplus of food available to these parasites permits survival by means of fermentations, but it is difficult to conceive that surplus food should result in loss of oxidative faculties. Helminths living in aerobic habitats are unquestionably descended from aerobically living non-parasitic ancestors which presumably were able to oxidize their food completely. There are two ways in which this faculty might have been lost. Various parasitic habitats may have a common factor inducing loss of powers by mutations so frequently that the original stock is eliminated although the mutations have no evolutionary advantages, or the loss may originate by spontaneous mutations independent of the environment. In the latter case the mutation must have had evolutionary significance, since otherwise the mutants could not have eliminated their unaltered ancestral stock. This interesting question apparently has never been discussed by geneticists or students of evolutionary processes.

Intermediate Carbohydrate Metabolism

In addition to comparative biochemical interest, studies of intermediate carbohydrate metabolism of helminths are important in explaining modes of drug action and in providing a foundation for a rational approach to chemotherapy. These latter aspects will not be considered here; they have been covered fully by Bueding & Swartzwelder (1957).

In recent years it has been demonstrated that the initial steps of sugar degradation by helminths consists of the classical Embden-Meyerhof phosphorylative glycolysis. This has been shown most convincingly for a cestode (scoleces of *Echinococcus granulosus*, Agosin & Aravena, 1959 b), a trematode (*Schistosoma mansoni*, Bueding & Most, 1953), and two nematodes (*Ascaris lumbricoides*, Rathbone & Rees, 1954; *Trichinella spiralis* larvae, Goldberg, 1958; Agosin & Aravena, 1959 a). The relevant experiments have been done either with whole homogenates, cell-free extracts, or acetone powders, and systems employed were patterned after those proven satisfactory for vertebrate tissues. Omitting details, a few requirements of these systems may be mentioned. In parasite preparations glycolytic processes, particularly the phosphorylative reactions, proceed at a higher rate in the presence of fructose-1, 6-diphosphate rather than glucose, the ester apparently acting as a phosphate reservoir.

Dephosphorylating reactions are often pronounced and must be controlled by fluoride; in the case of *Echinococcus*, for instance, they degrade phosphorylated intermediates as well as adenosine di-, tri-, and even monophosphate. In preparations of *Ascaris*, *Trichinella*, and *Echinococcus*, pyruvate must be added to the system as substrate for the reoxidation of the reduced diphosphopyridine nucleotide formed during glycolysis; in the absence of pyruvate,

the rate of phosphorylation is markedly reduced.

In none of the above mentioned worms have all the enzymes of the Embden-Meyerhof sequence been demonstrated; however, enough of the key enzymes have been found to validate the assumption of its presence. Rather than enumerate all the enzymes reported, only the most interesting aspects of these studies will be reviewed here. Differences have been demonstrated between host enzymes and parasite enzymes as well as between enzymes isolated from various worms. One such difference is substrate specificity. Schistosoma mansoni, (Bueding, Ruppender & MacKinnon, 1954; Bueding & MacKinnon, 1955) and Echinococcus granulosus, (Agosin & Aravena, 1959 b) contain specific hexokinases for the phosphorylation of glucose, fructose, mannose, and glucosamine, while a single enzyme, or sometimes two, fulfill the same tasks in vertebrate tissues. Schistosoma extracts can phosphorylate 2-deoxyglucose, Echinococcus cannot; the latter's fructokinase is inhibited by glucose-6-phosphate, the former's is not.

The aldolase of neither *Trichinella spiralis*, (Agosin & Aravena, 1959 a) nor *Taenia crassiceps*, (Phifer, 1958) appears to contain essential sulph-hydryl groups nor is metal activation demonstrable, while the *Trichinella* aldolase is markedly inhibited by the iron, zinc, and

especially copper ions.

Another distinction between parasite and host enzymes is their kinetics. For instance, the pH optima in both directions of the reaction are different for the lactic dehydrogenases of schistosomes and rabbit muscle; furthermore the optimal pyruvate concentrations as well

as the Michaelis-Menten constants differ (Mansour & Bueding, 1953). A further proof for a chemical difference between schistosome and rabbit lactic dehydrogenase has been presented by Henion, Mansour & Bueding (1955) who demonstrated the immunological specificity of these enzymes. It is interesting that this approach also demonstrates a chemical difference between schistosome and vertebrate enzymes which have identical catalytic activity and kinetics. Bueding & MacKinnon (1955 b) have reported this distinction between phosphoglucose isomerases of schistosomes and rabbit muscle. The specificity of their procedure is confirmed by the observation that an antiserum against lactic dehydrogenase of schistosomes did not affect the activity of the phosphoglucose isomerase of the same worm, nor did an antiserum developed against the latter enzyme interfere with the activity of the former. According to Bueding & MacKinnon (1955 b) this indicates that the antisera react with sites specific for a particular enzyme rather than schistosome proteins in general.

Little is known about the occurrence of alternate pathways of glucose utilization in helminths. De Ley & Vercruysse (1955) demonstrated two enzymes of the pentose phosphate pathway, glucose-6-phosphate and gluconate-6-phosphate dehydrogenases in various trematodes, cestodes, and nematodes. In addition, Entner (1957) found ribose-5-phosphate isomerase, xylulose-5-phosphate isomerase, and transketolase in Ascaris muscle. He also demonstrated the formation of sedoheptulose phosphate from ribose-5-phosphate, and more recently detected a transaldolase (Entner & Gonzalez, 1959). Agosin & Aravena (1959 c) demonstrated glucose-6-phosphate and gluconate-6-phosphate dehydrogenase, ribokinase, and a phosphopentose isomerase in Echinococcus scoleces. They identified sedoheptulose, glyceraldehyde, dihydroxyacetone, ribulose, fructose, and glucose as formed from ribose-5phosphate, indicating the presence of a transketolase and transaldolase. It seems likely that in these two worms a partial or complete pentose phosphate pathway may be operative, but it is too early to assess its in vivo significance. Entner & Gonzalez (1959), using labelled substrates, reached the conclusion that in Ascaris glucose is degraded mainly by glycolysis and only to a small extent by the pentose-phosphate pathway.

Little is known about the final degradation in aerobic carbohydrate utilization. An apparent complete cytochrome system has been found in Trichinella larvae (Agosin, 1956; Goldberg, 1957). Goldberg (1957) also has demonstrated the presence of several enzymes of the tricarboxylic acid cycle, (aconitase, isocitric dehydrogenase, fumarase, and malic dehydrogenase), and showed that succinate and α -ketoglutarate stimulate the respiration of homogenates. He considers his findings good evidence that the Krebs cycle functions in the larvae, although its importance to the intact larva remains to be established. It should be remembered that the level of aerobic fermentation is approximately that of the anaerobic ones.

Similarly, the finding of Krebs cycle dehydrogenases in infective larvae of *Strongyloides papillosus* by the Thunberg technique (Costello & Grollman, 1959) cannot be accepted as definite proof for a cycle functioning in intact larvae. In *Hymenolepis diminuta* cytochrome oxidase, succinic and malic dehydrogenase, as well as fumarase have been found, but isocitric and citric dehydrogenases appear to be absent (Read, 1952, 1953). In *Hymenolepis nana* succinic dehydrogenase activity has been observed by Goldberg & Nolf (1954). In all these cases the evidence is too fragmentary to allow fruitful speculations as to the biological significance of these findings.

Considerably more information is available for Ascaris. Its respiration is not mediated through the cytochrome system (Bueding & Charms, 1952). The oxygen consumption of suitable fortified particulate suspensions of muscle tissue is stimulated by succinate, α -ketoglutarate, and malate, but not by other intermediates of the Krebs cycle (Rathbone, 1955). A powerful succinic oxidase from Ascaris muscle was partially purified by Bueding, Entner & Farber (1955) and by Farber & Bueding (1956). Saz & Hubbard (1957) found fumarase and malic dehydrogenase in addition to a malic enzyme which decarboxylates malate. Unlike all analogous systems described no oxaloacetic decarboxylase activity was present. Even though the oxidations of Ascaris appear not to correspond to a full tricarboxylic cycle, they may still be of importance from an energetic standpoint, since oxidative phosphorylations have been

demonstrated in this worm (Chin & Bueding, 1954; Rathbone, 1955). They proceed at a low rate and in contrast to mammalian mitochondria the worm particulates require an unidentified, undialysable component of the perienteric fluid. Pyruvate and, to some extent, α-ketoglutarate and ethanol could serve as substrate, but not succinate (Chin & Bueding, 1954), although this acid occurs in relatively high concentration in the perienteric fluid (Bueding & Farrow, 1956).

Recent studies (Saz & Vidrine, 1959) have shown that Ascaris forms succinic acid from pyruvate by carbon dioxide fixation and subsequent reduction. On the other hand, Ascaris muscle strips can also directly decarboxylate succinic acid to propionic acid and carbon dioxide, a process previously known only for bacteria. Saz & Vidrine (1959) had observed the formation of α-acetolactic acid from pyruvate by Ascaris homogenates and obtained evidence that this compound may be a precursor of tiglic and α-methylbutyric acids. The main relevant evidence consists in the observation that Ascaris contains enzymes which catalyze both the reduction of α-acetolatic acid by reduced diphosphopyridine nucleotide, and also the reduction of α-methyl acetoacetic acid. On the other hand, it is improbable that α-acetolactic acid is a precursor of acetylmethylcarbinol, since no α-acetolactic acid was demonstrable in the worm. Saz, Vidrine & Hubbard (1958) found that Ascaris homogenates can form acetoin from pyruvic acid or from acetaldehyde, with acetoin production increasing in the presence of a combination of the two substrates. Evidence indicates the mechanism of formation is an acyloin condensation reaction of pyruvate oxidase.

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BOOK REVIEWS

COLE, V. G., 1958. "Graziers' handbook of diseases of sheep, beef cattle, horses and dogs." Sydney: Grazcos Co-operative Ltd., 278 pp.

This may be regarded as the second edition of a book published in 1955, which the author has prepared primarily for reference for the Australian stockowner. The internal parasites of sheep, cattle, horses and dogs are tabulated together with their importance. Diagnosis, symptoms and control are discussed, and the various anthelmintics mentioned are accompanied by descriptions of their uses, doses and toxicity.

MARSH, H., 1958. [Montana Veterinary Research Laboratory, Montana State College, U.S.A.] "Newsom's sheep diseases." London: Baillière, Tindall & Cox Ltd., 2nd Edition, xiv + 406 pp.

This second edition of Newsom's book, first issued in 1952, has been compiled by Hadleigh Marsh, D.V.M., of the Montana State Research Laboratory, Montana State College. Intended for veterinarians, veterinary students and research workers and for sheep producers, the book has been written with conditions in the U.S.A. in mind, but it also includes important diseases of sheep in all countries. Advances in knowledge since its first issue have been incorporated and many parts of it have been entirely rewritten. Chapter VII is devoted to helminthic infections. So far as diseases common to all stock are concerned, the author has not included methods of diagnosis and treatment, except in so far as special methods for sheep are needed, and the use of instruments and methods of handling sheep are not discussed, although the author hopes to include these in a later edition. The bibliographies at the ends of the chapters give only publications mentioned in the text. There are many useful photo-G. Lapage graphic illustrations in the text.

MOZLEY, A., 1959. "Ecological Processes." London: H. K. Lewis & Co. Ltd., xi+68 pp. In this small volume, which continues his series on molluscan ecology in relation to trematode diseases of man and domestic animals, Mozley is primarily concerned with the situations which arise where organisms come into contact with a changing environment. Ecological succession, the consequences of community alteration or destruction, and the importance of successional changes, population fluctuations and movements, are some of the topics discussed with particular reference to fresh-water snails. Stress is laid on the importance of ecotones (transition areas between different communities, occupied by mixed and fluctuating populations) as breeding sites for snails. There follows a summary in very general terms of some of the methods that can be adopted for dealing with ecotones. There are two appendices, one of which summarizes Fry's [Univ. Toronto Studies, Biol. Series No. 55, 1947] classification of environmental influences, while the other attempts to define ecological stability in the fundamental terms of physics.

J. M. Watson

SUMMARY OF REPORTS

[Only those sections relating to helminthology are abstracted.]

EAST AFRICA. "East African Agriculture and Forestry Research Organization. Record of Research for the period 1st January to 31st December, 1958." Nairobi: Government Printer, 109 pp. (Received 24.11.59.)

During 1958, the survey of plant-parasitic nematodes in East Africa has been completed showing that at least 25 genera of eelworms occur. A detailed taxonomic study of the principal genera present is in progress. The distribution of *Meloidogyne* spp. is outlined; several new species were encountered particularly in the higher altitude areas. An analysis of 105 samples from wayside grasses along a 5,000 mile stretch indicates that many phytonematodes are very wide-spread. A study of the tylenchid fauna of indigenous forest shows that all the genera normally found in cultivated soils were present. A sampling experiment has been carried out on a badly diseased pyrethrum plantation in Kenya to assess nematode population changes throughout the year, the extent of the damage and the intra-field variability. A list is included which gives the principal eelworm attacks on crops and their distribution in East Africa. The following are especially noted: two attacks of *Aphelenchoides* spp. on coconut palm; a new species of *Meloidogyne* affecting 60% of arabica coffee nurseries in the Meru district of Kenya; root-knot nematodes in conjunction with *Fusarium vasinfectum* on cotton in Tanganyika and Uganda; and high populations of several nematodes including *Helicotylenchus*, *Pratylenchus* and *Meloidogyne* on sugar-cane in parts of Uganda and on the Kenya coast.

ENGLAND & WALES. "Agricultural Improvement Council for England and Wales. Fourth report, 1956-59". London: H.M. Stationery Office, iv+27 pp. (Received 13.1.60.)

In the section on problems considered by the Council, it is stated that although the position in respect of the potato and cereal root eelworms has improved since the Council's Third Report, two other nematodes are now causing concern: (i) the pea root eelworm, due to the rapid increase in acreage of peas grown for canning and freezing, and (ii) the lucerne stem eelworm, a serious potential danger.

G. I. Pozniak

KENYA. "Veterinary Department Annual Report 1958." Nairobi: Government Printer, 99 pp. (Received 28.9.59.)

Animal Health and Meat Inspection Services report (i) a 2% decrease of Cysticercus infection among European-owned cattle of the Athi River Factory, and (ii) that internal parasites were the greatest single trouble in sheep, taeniasis causing up to 10% mortality among weaners on some farms in the Nakuru District. Laboratory Services report that trials are in progress on the anthelmintic effect of a preparation containing hygromycin B. Reports of abortion in sows followed its use in the field but no confirmation of such an effect was obtained in guinea-pigs in the laboratory. A survey on beef measles commenced at the Kenya Meat Commission abattoir at Athi River produced valuable information on the incidence of different parasites. Work is being done on the infectivity of Taenia ova to lambs and on their hatching response and dissemination.

G. I. Pozniak

NEW ZEALAND. "Report of the Department of Scientific and Industrial Research for the year ended 31 March, 1959." Wellington, N.Z.: Government Printer, 112 pp. (Received 17.9.59.)

The following research projects are reported. Animal Ecology Division: a study of the geographical distribution of rabbit nematodes in the North Island, and of the possible role played by the three known nematode species in the natural control of rabbit populations. Massey Agricultural College: an investigation of the possible inhibition of *Haemonchus* parasitism in sheep grazing certain grasses and clovers in pure stand; the process of development of resistance to parasitism; and the epidemiology of roundworm infections in sheep. Entomology Division: an attempt to discover the role played by soil nematodes in the fertility of soils, and work on the lucerne eelworm which has become troublesome in the South Island. The distribution of *Anguina agrostis* on browntop grass in North Canterbury has been investigated.

NORTHERN IRELAND. "Agricultural Research Institute of Northern Ireland. 32nd Annual Report 1958-59." Hillsborough, Co. Down: 42 pp. (Received 11.12.59.)

Experiments have been conducted during the year to study (i) the effect of grazing with "immune" cows on the larval *Dictyocaulus viviparus* population of a known "hoose" pasture, and (ii) aspects of epidemiology of *Nematodirus* disease in young lambs under a high level of set stocking, the persistence of *Nematodirus* infection on unused pasture, the effect of mixed grazing on lamb infections, the effect of *Nematodirus* infection on live weight increases and the efficacy of bephenium embonate in preventing *Nematodirus* infection. G. I. Pozniak

RHODESIA & NYASALAND. "Report of the Secretary to the Federal Ministry of Agriculture for the year ended 30th September, 1958." Salisbury: Government Printer, 215 pp. (Received 28.10.59.)

With the growing establishment of irrigated pastures (chiefly for sheep production) a special effort is being made to stimulate farmers to exercise proper management and regular control of parasites. About 95% of sheep livers are condemned in the country due to Stilesia hepatica infection. In the Salisbury district, an alarming over-all incidence of liver-fluke in cattle was observed and urinary schistosomiasis was demonstrated in 2.6% of 953 bladders examined. Experiments have been started (i) to investigate the seasonal variation of helminthiasis in sheep, (ii) to check all the local snail species as possible hosts of Fasciola gigantica, (iii) to test the comparative efficacy of hexachlorethane, Hexaphine and Carbergan against F. gigantica in cattle, and (iv) to determine the life-cycle of Stilesia hepatica. In plant pathology, experiments are in progress to test the longevity of Meloidogyne javanica in various soil types in the absence of host plants and to breed pure lines of each of the species of Meloidogyne known in the Federation. Of 13 species of legumes sent in for examination for eelworms, six were found to be infected including Trifolium cemipilosum, one of the most promising of recent introductions.

G. I. Pozniak

TRINIDAD & TOBAGO. "Administration Report of the Agricultural Department for the year 1957." Port of Spain: Government Printing Office, viii+49 pp. (Received 24.11.59.)

It is reported that *Radopholus similis*, which causes "Blackhead Toppling" of banana plants in Jamaica, has now been found in Trinidad, that *Meloidogyne* sp. proved to be the limiting factor in the growth of tomatoes at Gran Couva where other pests were kept under control by low volume spraying with D.D.T., and that investigations into red ring disease of coconut (*Aphelenchoides cocophilus*) are being initiated.

G. I. Pozniak

ABSTRACTS

When an address accompanies an abstract, it is that of the first author.

MEDICAL HELMINTHOLOGY

Surveys

See also Nos.: 827, 831, 834, 841, 877, 878, 883.

429—ANON., 1959. "Enfermedades enteroparasitarias." Boletín Chileno de Parasitología, 14 (2), 35-38.

This article is in the form of questions and answers and deals in general terms with the clinical aspects and transmission of internal parasites of man in Chile. A table, compiled from the parasitological surveys made on 13,317 individuals between 1948 and 1954, gives the incidence of Ascaris lumbricoides, Trichuris trichiura, Taenia sp. and Hymenolepis nana in the five geographical areas of the country. The table shows that T. trichiura infection was observed in 4.83% of 1,654 persons in Zone I and 60.91% of 5,529 persons in Zone IV. M. McKenzie

430—ATCHLEY, F. O., 1959. [Communicable Disease Center, U.S. Department of Health, Education and Welfare, Bureau of State Services, Public Health Service, Phoenix, Arizona, U.S.A.] "Significance of human intestinal helminths in eastern Kentucky." Journal of Parasitology, 45 (5), 518. Single stool examinations of 1,244 patients at admission to a hospital in Kentucky showed 32% to be infected with helminths. These were Ascaris lumbricoides (12%), Trichuris trichiura (14%), Strongyloides stercoralis (5%) and hookworm (1%). In 7% of the patients helminthiases were included in the final hospital diagnosis.

G. I. Pozniak

431—BIOCCA, E., 1959. [Institute of Parasitology, University of Rome.] "Studies of intestinal helminthiasis in Jewish communities in Iran." Parassitologia. Rome, 1 (1), 21–62. [Appendix pp. 63–67.]

This extensive account of the occurrence of infection with intestinal helminths among the Jews of Iran is divided into three sections. The first section deals with the results of stool and adhesive cellophane tape examinations in various parts of the country, the data being summarized in four tables. Examination of children and adults in various cities and areas showed Ascaris infection to be the most serious and frequent, and Hymenolepis nana infection to be extensive in Teheran, especially in kindergarten children. Both Taenia saginata and infection with Trichostrongylus sp. were common and wide-spread. This last-named infection seemed to be linked with the practice of selling the lower intestines and rectum of sheep still containing faeces. T. orientalis was isolated in experiments on lambs (see below). Enterobius vermicularis infection also showed a high prevalence among the groups tested. The Scotch tape method was remarkably successful in detecting infection with Ascaris lumbricoides in addition to its routine use in the diagnosis of enterobiasis. The apparently low prevalence of trichuriasis (except in Nahawand) is attributed to unsatisfactory technique. No cases of hookworm infection or strongyloidiasis were found. The second section, which consists of a discussion of the epidemiological factors influencing intestinal helminthiasis in the Jewish population of Iran, does not lend itself to abstracting. The third section deals with the anthelmintic efficacy of papain, piperazine, hexylresorcinol, oxytetracycline and arecoline hydrobromide. Piperazine, either as the base or adipate, gave encouraging results against both Uncinaria stenocephala and Toxocara canis in dogs. Arecoline was effective against Dipylidium and was the only drug active against cestodes in dogs. In man piperazine combined with

^{*} Titles so marked throughout this number have not been seen in the original.

small doses of papain was best against Ascaris and Enterobius, but against H. nana or Trichostrongylus tetrachlorethylene was better. Among other recommendations the author concludes that in Iran mass treatment for ascariasis is required and general hygiene measures urgently necessary.

W. K. Dunscombe

432—COUTINHO, J. O. & FIGUEIRA, F., 1958. "Notas sôbre parasitoses intestinais em crianças de Vila Mariana, São Paulo." Pediatría Prática. São Paulo, 29 (1), 15-22. [English summary p. 22.]

Coutinho & Figueira have studied the incidence of intestinal parasites in children from Vila Mariana, São Paulo. The results are presented in a number of tables and histograms showing the distribution of infection relative to age, sex and colour. The authors show that the incidence of Ascaris lumbricoides is greater in the lower age groups while the reverse is true of Ancylostoma; and that white children are more heavily infected with Ancylostoma than non-whites.

C. A. Wright

433—FOURNELLE, H. J., WALLACE, I. L. & RADER, V., 1958. [Bacteriology Unit, Arctic Health Research Center of the Public Health Service, Anchorage, Alaska.] "A bacteriological and parasitological survey of enteric infections in an Alaskan Eskimo area." **American Journal of Public Health, 48** (11, Pt. 1), 1489–1497.

In Alaska where diarrhoea is a major health problem, a survey was made of its occurrence together with the occurrence of the causative bacterial pathogens and of intestinal parasites among the Eskimo population of ten villages and nine fishing camps. 33.7% of the population (average age 10 to 19 years) gave histories of diarrhoea. Protozoan parasites were more frequent than helminths. The only significant infection with the latter was *Diphyllobothrium* sp. (prevalent in 10.2% in villages and 11.9% in fishing camps). The incidence of *Enterobius vermicularis*, *Trichuris* sp. and hookworm was low. In dogs, hookworms were the most frequent helminth parasites. There was no clear correlation between the occurrence of diarrhoea and that of parasites.

434—GOLDMAN, M. & CARVER, R. K., 1959. [Department of Health, Education, and Welfare, Public Health Service, Communicable Disease Center, Atlanta, Georgia, U.S.A.] "An intestinal parasite survey on Rongelap Atoll in the Marshall Islands." American Journal of Tropical Medicine and Hygiene, 8 (4), 417–423.

No significant difference was found between parasitic infections of a group of 69 Marshall islanders exposed to radio-active fall-out four years previously and a group of 112 unexposed islanders now living in the same atoll. The over-all rates of helminth infections, determined by single stool examinations, were *Trichuris trichiura* 34·3% and hookworm 5·5%, the worm burdens being generally low. *Ascaris* was absent. The infections were studied in relation to the age and sex of the islanders.

G. I. Pozniak

435—HUBER, A. & KNORR, R., 1959. [Imperial Guard Hospital, P.O. Box 1195, Addis Ababa, Ethiopia.] "Darmparasiten bei äthiopischen Frauen." Deutsches Medizinisches Journal, 10 (1), 18-21.

786 of 1,000 Ethiopian women examined at a maternity and gynaecological clinic in Addis Ababa were infected with worms and other intestinal parasites. Ascaris lumbricoides was present in 218, Taenia saginata in 51, Trichuris trichiura in 72, Ancylostoma duodenale in 13, Strongyloides stercoralis in 55 and Hymenolepis nana and oxyurids in a few. The infections are considered in relation to symptoms, complications, treatment and local habits of diet and behaviour. They present a difficult problem of differential diagnosis to the doctor in the tropics.

G. I. Pozniak

436—KUNTZ, R. E., 1959. [Naval Medical Research Unit No. 2, Taipei, Taiwan.] "Intestinal protozoans and helminths in U.S. military and allied personnel, Naval Hospital, Bethesda, Maryland." American Journal of Tropical Medicine and Hygiene, 8 (5), 561–564.

Kuntz reports upon examination from 1946 through 1957 of 37,000 specimens of faeces of

Kuntz reports upon examination from 1946 through 1957 of 37,000 specimens of faeces of patients and dependants in the Naval Hospital, Bethesda, U.S.A. The nematodes found were hookworm [species not stated], Ascaris lumbricoides, Enterobius vermicularis, Trichuris trichiura,

Strongyloides stercoralis, Trichostrongylus spp. and Meloidogyne. Hookworm incidence was never less than 0.5% in any one year. Cestodes found included Taenia spp. (chiefly T. saginata), Hymenolepis nana and one case of Diphyllobothrium latum. Trematodes included Clonorchis sinensis, Schistosoma japonicum and S. mansoni. The author states that the helminth infection rate was very low but admits that the 1957 figures show an increase. A table gives the incidence for each parasite for each of the nine years.

W. K. Dunscombe

437—SCHAPIRO, M. M. & MOLINA, J. J., 1959. [Casa de Salud El Carmen, Tegucigalpa, Honduras.] "Intestinal parasitism among the inmates of the Central Penitentiary, Tegucigalpa, Honduras." Transactions of the Royal Society of Tropical Medicine and Hygiene, 53 (3), 270-277.

At the Central Penitentiary in Tegucigalpa, Honduras, 1,492 inmates aged 15 years and over and otherwise healthy, were examined for intestinal parasites. The only variables in the environmental conditions of the survey were the prison sanitary facilities and the habits of the inmates. Of the 1,083 positive results obtained, 583 were multiple infections; most of these were various helminths with *Entamoeba histolytica* which was the parasite most frequently encountered. Single infections with *Ascaris lumbricoides* were present in 120 persons and of *Strongyloides stercoralis* in 99. *Trichuris trichiura*, occurring in 11.6% of the inmates, fell into fourth place although on the North Coast it is known to predominate. The low incidence of *Necator americanus* (13 cases) and of *Taenia* (four cases) is of interest because of the existing impression that both are frequent in native Honduras.

Trematoda

See also Nos.: 527, 641, 694, 835, 836, 841, 843, 844, 845, 855, 860, 862, 878, 929, 950, 952, 956, 957, 962, 967, 972, 980.

438—AHLUWALIA, S. S., 1959. [U.P. College of Animal Husbandry and Veterinary Science, Mathura, India.] "Let's say a firm 'no admission' to flukes." Indian Farming, 9 (7), 7-9.

Ahluwalia briefly reviews the structure, life-history, sources of infection and methods of control of human and porcine infection with Fasciolopsis buski, Gastrodiscoides hominis and Paryphostomum sufrartyfex.

J. M. Watson

439—ALESSANDRI, H. & MATURANA, G., 1959. [Hospital del Salvador.] "Breve nota sobre un nuevo caso de distomatosis hepática complicado con empiema vesicular." Boletín Chileno de Parasitología, 14 (2), 38-39. [English summary p. 38.]

An emergency operation on a 49-year-old man revealed empyema of the gall-bladder and the presence of two adult *Fasciola hepatica* in the bile-ducts, without concomitant chole-lithiasis. Such cases are rare in the medical literature. The patient's subsequent progress was satisfactory.

M. McKenzie

*440—ANON., 1958. [Emetine and emetine combined with chloroquine in treatment of paragonimiasis.] Chinese Journal of Internal Medicine, 6 (12), 1179–1183. [In Chinese.]
Forty cases of paragonimiasis with no previous medication were treated with one to five courses of emetine. 21 of these cases were cured, 17 by one to three courses, and four by more than three. 12 further cases (ten of which, a year previously, had received emetine and chloroquine separately without success) were given the drugs together. All 12 cases were cured with one to three courses. Compared with 52.5% success of emetine alone, emetine and chloroquine combined treatment is the method of choice. [Taken from an abstract in Chin. med. J. Peking, 78, p. 185.]

441—ANON., 1959. "Acupuncture in treatment of schistosomiasis. Clinical observations on 54 cases." Chinese Medical Journal. Peking, 78 (1), 15–17.

This report gives observations on 54 cases of schistosomiasis treated by acupuncture. All the

This report gives observations on 54 cases of schistosomiasis treated by acupuncture. All the cases were proved positive by intradermal test and stool examination before treatment. The acupuncture points adopted were basically eight in number (TM 13, TM 12, VU 17, VU 19, VU 25, VU 27, V 25 & V 36), but more points were added in cases with severe symptoms.

Details, with indications and depth of insertion, are given in a table. Moxibustion was not employed. In most cases, symptoms subsided and physical strength increased by the end of treatment. Stool hatching tests became negative in 16 cases $(29\cdot6\%)$. Follow-up examination one to two-and-a-half months later revealed that six more cases had become negative, raising the cure rate to $40\cdot7\%$. There are four tables. [The number of further cases which were found negative at follow-up is given as eight in the text but is shown to be only six in Table 4. The latter figure tallies with the percentage in the text.] The convenience and cheapness of acupuncture is emphasized and further research urged.

J. M. Watson

442—BONSEL, J., STAM, A. B., STAM-MIELZINER, S. J. & THIEL, P. H. van, 1958. [Department of Dermatology, Volkarding Hospital, The Hague, Holland.] "Schistosoma dermatitis in The Hague." Tropical and Geographical Medicine. Amsterdam, 10 (3), 239–244. [Spanish summary p. 244.]

Bonsel et al. report an outbreak of cercarial dermatitis in The Hague. The causative organism appears to be a cercaria of the ocellata group which was found to be present in Lymnaea stagnalis collected in the vicinity of the outbreak.

P. Knight

- *443—CHOU, C., P'AN, C. T., T'UNG, P. C. & SHEN, J. S., 1958. [Schistosomiasis in children treated with antimony potassium tartrate: clinical observations of 84 cases.] Chinese Journal of Pediatrics, 9 (6), 534–536. [In Chinese.]
- 444—CORRÊA, M. O. A. & AMATO NETO, V., 1957. "Tratamento da esquistossomíase mansônica por via oral: resultados obtidos com o emprêgo do cloridrato de miracil D (esquema de 20 dias) e do óxido estanhoso." Hospital. Rio de Janeiro, 51 (3), 347–350. [English summary pp. 349–350.] Corrêa & Amato Neto gave daily doses of miracil-D to nine patients with Schistosoma mansoni infections. The doses were of 400–600 mg. daily given as 200 mg. two or three times each day for a period of 20 days. Subsequent observations for periods of three to nine months revealed that none of the cases was cured. The drug was not well tolerated and nausea, vomiting, loss of appetite, diarrhoea, abdominal pain, weakness, general lack of well-being, giddiness and insomnia were observed as side effects. Bilharstan, a stannous oxide preparation, was given to two patients, eight tablets of 0.05 gm. daily for three courses of eight days each with intervals of a week between courses. One of the patients complained of side effects similar to those described for miracil-D but the other tolerated it well. Neither was cured.

C. A. Wright

445—FOURCHON, J. & DUMONT, R., 1958. "Deux cas d'infiltrat pulmonaire labile au cours de la distomatose hépatique." Journal Français de Médecine et Chirurgie Thoraciques, 12 (5), 591–596.

Fourchon & Dumont describe in some detail two cases of pulmonary eosinophilia in man in which Fasciola hepatica was incriminated by intradermal tests. They discuss the differential diagnosis of this condition.

J. M. Watson

446—GENEVRIER, R. & BOURGEOIS, M., 1958. "A propos d'un infiltrat pulmonaire hyperéosinophilique d'origine distomienne." Journal Français de Médecine et Chirurgie Thoraciques, 12 (6), 691-694.

Genevrier & Bourgeois give a detailed report of a case of pulmonary eosinophilia in which Fasciola hepatica was incriminated by complement fixation reaction, and discuss the general implications of their findings.

J. M. Watson

*447—HSÜ, P. K. & CH'EN, H. T., 1958. [Relationship of topographic conditions to the endemicity of schistosomiasis in Kwangtung province.] National Medical Journal of China, 44 (11), 1035–1039. [In Chinese.]

Hsü & Ch'en report that the endemic areas of schistosomiasis in Kwangtung province are, with the exception of Tsengch'eng, scattered along the North River Valley. In the northern section of the river the vector snails breed mainly in ditches connected with rice fields; man becomes infected by agricultural activities; and water contamination by the use of nightsoil as fertilizer is of prime importance. In the southern section, on the other hand, the snails breed mainly in marshes; human infection may take place in a variety of occupations; and

animal faeces, especially cow manure, constitute the chief source of water contamination. Data concerning detailed distribution of the endemic areas and of *Oncomelania* spp., the breeding requirements of these snails, seasonal considerations, and proposed control measures are presented and discussed. [Based on an abstract in **Chin. med. J. Peking, 78, p. 83.**]

I. M. Watson

448—ITO, I., 1958. [Clinical observations on 36 cases infected with *Paragonimus westermani*.] **Journal**of the Yonago Medical Association, 9 (5), 804–806. [In Japanese.]
Thirty-six cases of paragonimiasis occurred in a hospital in the Kochi Prefecture from January 1955 to December 1957. The ratio of the paragonimiasis patients to the pulmonary tuberculosis patients was 1:16. The most frequent symptom was haemoptysis. Radiological examination was not always reliable in diagnosis, hence examination of sputum and faeces for the eggs of the worm was considered necessary.

Y. Yamao

449—KAWANO, T., 1959. [Department of Parasitology, Faculty of Medicine, Keio University, Tokyo, Japan.] [Studies on paragonimiasis westermanii. I. Epidemiology.] Keio Igaku, 36 (7), 787–800.

[In Japanese: English summary pp. 799–800.] In the south-western part of Ehime Prefecture, 3,827 primary schoolboys and 1,007 outpatients and local residents were examined for paragonimiasis by skin test (PG test), sputum and faecal examinations, and indirect roentgenography. The positive rate of the PG test was 12.6% for the schoolboys and 39.5% for the rest of the subjects examined. The positive PG test rate was 10.5% among the first graders, which definitely indicated that the infection already occurred early in childhood, gradually increasing into adolescence. The positive rate of the sputum or faecal examination was parallel to the skin test result among the schoolboys and adolescents, but it was quite low among adults despite their high positive skin test. Organized collective examination for paragonimiasis should include the skin test concomitantly with the tuberculin test, the stain and culture method of sputum, sputum analysis when needed and indirect or direct roentgenography. Prophylaxis should include prohibition of catching or cooking fresh-water crabs.

*450—KU, Y. L. & LIU, C. Y., 1958. [Short course antimony therapy of schistosomiasis in children.] Chinese Journal of Pediatrics, 9 (6), 538–541. [In Chinese.]

*451—LIU, C. S., HSÜ, C. & TS'AI, C. Y., 1958. [Rectoscopy in schistosomiasis japonica.] Chinese Journal of Internal Medicine, 6 (12), 1177–1178. [In Chinese.]

As a result of rectoscopic examination of 157 chronic mild cases of *Schistosoma japonicum* infection, Liu *et al.* suggest taking more than one specimen in several different locations in one rectoscopy. They also advise rectoscopy being used in mass surveys because of its simplicity. Skin test with 1:4,000 liver-ova antigen, cercarial membrane reaction, anti-ova precipitin test and complement-fixation test were performed simultaneously with 47 cases and as a result the authors suggest that these tests are a useful aid to diagnosis. [Taken from an abstract in **Chin. med. J. Peking, 78, p.** 185.]

N. A. Hancock

452—LOURMET, J., BEYTOUT, A., BEYTOUT, D. & JARDIN, C., 1959. [Service de Santé des Troupes d'Outre-Mer.] "Accidents consécutifs à un traitement stibié. Utilisation d'un chélateur." Médecine Tropicale, 19 (1), 103-106.

Lourmet et al. describe the clinical course in a patient who, on relapse of his vesical schistosomiasis contracted in French West Africa, was again treated with lithium antimony thiomalate. Severe intoxication resulted, with accompanying high fever, general pains, severe oliguria, and a large post-injection abscess in the buttock. The patient was then treated with a chelating agent (sodium versenate) and calcium glucoheptagluconate, and subsequently with δ -cortisone also. He recovered completely. The importance of using a chelating agent instead of BAL in antimony poisoning is emphasized.

W. K. Dunscombe

453—MATSUI, K., TAKIKAWA, K., SOTOZONO, S. & IDO, T., 1958. [An autopsy case of cerebral paragonimiasis which was wrongly diagnosed as tuberculous meningitis.] Journal of the Yonago Medical Association, 9 (5), 927–934. [In Japanese.]

The authors report a case of cerebral paragonimiasis which was found at post-mortem examination, having been clinically diagnosed as tuberculous meningitis.

Y. Yamao

454—MAYAT, M. G. H., 1959. [Department of Gynaecology and Obstetrics, University of Natal, South Africa.] "Ectopic pregnancy in a tube infested with Bilharzia." **South African Medical Journal, 33** (11), 219–220.

Mayat reports in detail from Natal a case of ectopic pregnancy in association with bilharzial salpingitis in an Indian woman aged 27 years. [It is not clear whether *Schistosoma mansoni* or *S. haematobium* was involved.]

J. M. Watson

455—MINSKY-KRAVETZ, B., 1959. [Service de Santé des Troupes d'Outre-Mer.] "Quelques aspects cliniques de la bilharziose intestinale en Martinique." Médecine Tropicale, 19 (1), 87-92. Mansonian schistosomiasis is endemic in the Antilles. In this paper ten cases are described in detail in which the disease was not suspected for some considerable time after admission to hospital and was only confirmed after faecal examination many days later. One European female had "anginal and nervous symptoms" without any history of possible infection. One male Martinique soldier had acute lumbago, another completely resistant eczema. None had intestinal symptoms or splenomegaly. Anthiomaline, usually together with Bilharstan, treatment cured all ten cases. [These cases emphasize the invariable rule of repeated faecal examinations in all doubtful or obscure cases in the tropics and sub-tropics.]

456—NEWSOME, J., 1959. [M.R.C. Bilharzia Research Group, St. Albans, Herts., U.K.] "Bilharzia control." **East African Medical Journal, 36** (2), 72–75.

Newsome urges that funds available for bilharzia control should be mainly spent on common

Newsome urges that funds available for bilinarzia control should be mainly spent on common sense measures of proven value with the aim of preventing spread and improving black spots, especially in cities. Field and laboratory research should not be relied on to produce quick and cheap results. Complete control is far in the future but enough good methods are known now to prevent spread and improve severe pockets of disease.

J. M. Watson

457—OLIVER-GONZÁLEZ, J. & HERNÁNDEZ MORALES, F., 1959. [Escuela de Medicina, Escuela de Medicina Tropical, San Juan, Puerto Rico.] "El diagnostico serológico de la esquistosomiasis: consideraciones sôbre investigaciones recientes." Boletín de la Asociación Médica de Puerto Rico, 51 (2), 41–46.

Oliver-González & Hernández Morales review some literature on the serological diagnosis of schistosomiasis from 1927 until 1956.

N. Jones

458—PURSER, J. R., 1959. [Yola, Nigeria.] "Some observations on the problem of urinary schistosomiasis control in Adamawa Province, Northern Nigeria." West African Medical Journal, 8 (2), 81-83.

Purser carried out combined treatment and control measures against schistosomiasis haematobia in two villages (Zinna and Yakoko) in Northern Nigeria where the incidence of the disease was high. 68 schoolchildren were given a three-day course of Fantorin (11 ml. per child) and all pools and marshes within a radius of one to two miles of each village were given three treatments with copper sulphate. Nevertheless, there was an increase in the number of positive urines during the twelve months following treatment and the sulphated pools were found to be heavily infested with *Bulinus* (*Physopsis*) globosa a few weeks after the rains had set in. Possible reasons for these failures are discussed.

J. M. Watson

459—SOUZA, V. P., 1958. "Diagnóstico e tratamento da esquistossomíase mansoni. Considerações sóbre a biopsia retal." Medicina, Cirurgia, Farmácia. Rio de Janeiro, No. 262/263, pp. 84–90. Souza reviews briefly the methods of diagnosis of schistosomiasis mansoni with special emphasis on rectal biopsies. He goes on to mention the principal methods of treatment for the disease and describes the most frequent symptoms. Eight patients were treated with sodium antimony gluconate and five of these were examined six months later and found to

be negative for eggs in the faeces; three of the five were also examinaed by rectal biopsy and again found to be negative. One patient treated with miracil-D failed to tolerate the drug and treatment was discontinued, while another who was treated with neo-antimosan died before the treatment was completed.

C. A. Wright

*460—T'AO, L., ET AL., 1958. [Three day treatment with tartar emetic for schistosomiasis in children.]

Chinese Journal of Pediatrics, 9 (6), 531-533. [In Chinese.] T'ao et al. describe their experiences with short course tartar emetic therapy for schistosomiasis in children. After preliminary trials with longer courses they finally adopted a regime in which a total dosage calculated on a basis of 12 mg. per kg. body-weight was administered intravenously daily for three successive days as one-third of the total dose diluted in 25% glucose solution. 66 children 3 to 13 years old, in all of whom stool hatching tests had shown schistosomiasis to be present, were so treated. In 89.7% of them the hatching test was negative 20-45 days later. One undernourished child developed yellow atrophy of the liver, but no other serious reactions occurred. [Based on an abstract in Chin. med. J. Peking, 78, p. 90.]

461—VERVOORN, J. D. & RATULANGIE, C. J. A., 1958. [Hwidiem Catholic Hospital, Hwidiem, Ahafo, Ghana.] "Some aspects of haematobium schistosomiasis in Ahafo (Ghana) and its treatment." Tropical and Geographical Medicine. Amsterdam, 10 (3), 221–228. [Spanish summary p. 228.

Vervoorn & Ratulangie examined 830 new patients in the Hwidiem Catholic Hospital, Ahafo (Ghana) and found 61 of them to excrete eggs of *Schistosoma haematobium*. In only one-fourth of these could clinical complaints be attributed to schistosome infection. The authors hold that the solution of the schistosome problem lies in prevention, particularly by safe water supplies. Heavily infected patients in endemic areas and all patients in non-endemic areas should be treated. Light infections in endemic areas are better left untreated unless subjective complaints exist or arise.

J. M. Watson

462—YEN, H. C., WU, H. N. & YAO, K. P., 1959. [Departments of Medicine, Shanghai Municipal First People's Hospital and Shanghai First Workers' Hospital, Shanghai, China.] "Acute cor pulmonale in acute schistosomiasis." Chinese Medical Journal. Peking, 78 (1), 22–26. Yen et al. report in detail two cases of cor pulmonale in acute schistosomiasis japonica, with particular reference to the clinical, radiological and electrocardiographic features. The mechanism of cor pulmonale in this disease is briefly discussed.

J. M. Watson

Cestoda

See also Nos.: 527, 528, 539, 548, 550, 558, 559, 562, 568, 572, 595, 610, 618, 620, 621, 624, 629, 630, 640, 642, 662, 667, 671, 675, 681, 684, 685, 688, 689, 690, 691, 832, 856, 859, 889, 897, 906, 915, 916, 917, 920, 921, 924, 928, 932, 933, 934, 959, 971, 975, 976.

463—ANTINE, W. & ROTHENBERG, S. P., 1959. [Department of Medical Services, Maimonides Hospital of Brooklyn, Brooklyn, New York, U.S.A.] "Hydatid cyst of the liver rupturing into the bile ducts: a case report describing a characteristic triad of symptoms." Annals of Internal Medicine, 50 (5), 1277–1282.

The characteristic triad of symptoms consists of biliary colic (right upper quadrant pain), urticaria and jaundice.

J. M. Watson

464—BULJEVIĆ, S. & ŠIBALIĆ, S., 1958. [Institut za invazione bolesti Veterinarskog fakulteta u Beogradu i Veterinarske stanice u Pančevu.] "Ehinokokoza u pančevačkom srezu." Veterinarski Glasnik, 12 (11), 930–935. [German summary p. 935.]

Buljević & Sibalić report on the incidence of hydatid disease in the Pančevo District [Yugoslavia] from 1948 to 1956. During that period 40 persons were treated surgically. The incidence in sheep was 95%, in cattle 78.4% and in pigs 34.8%. Echinococcus polymorphus was much more frequent than E. multilocularis. The incidence of fertile cysts was also great. Echinococcus granulosus was found in 29.8% of house dogs and in 59.4% of stray dogs. N. Jones

465—COHEN, G., 1958. [Department of Radiology, Johannesburg General Hospital.] "Cyst-wall calcification in intracranial cysticercosis." **South African Medical Journal**, **32** (43), 1033–1034.

466—COSTA, A. DE L., FIGUEIREDO, H. B. DE & SERRA, J. P., 1957. "Cisticercose do sistema nervoso." Arquivos Brasileira de Medicina, 47 (11/12), 407-430.

Costa *et al.* have studied three cases of cysticerciasis of the nervous system. In two of the cases the site of the infection was the brain and in the third it was the medulla. The authors describe the cases in detail and present a general review of the subject with special emphasis on medullary infections.

C. A. Wright

467—DONCKASTER, R., 1959. [Departamento de Parasitología, Universidad de Chile.] "El diagnóstico parasitológicoy tratamiento de las teniasis." Boletín Chileno de Parasitología, 14 (2), 33–35. [English summary p. 33.]

Donckaster describes briefly the methods of diagnosing infections of Hymenolepis nana, Taenia solium, T. saginata and Diphyllobothrium latum, which are the important tapeworms of man in Chile. The out-patient clinic of the Department of Parasitology of the University of Chile treats cases of T. solium, T. saginata or D. latum infection as follows: the diet is kept free of foods containing cellulose and the patient receives two enemata of soap solution or saline; an acridine derivative is then administered to a total dosage of 0.4 gm. to 1.0 gm. according to age; this is divided into two doses, given two hours apart, followed an hourand-a-half later by a strong saline purge. By this method over 85% of the patients are cured. The author claims that, contrary to widely held opinion, the proglottides of T. solium are motile when expelled.

M. McKenzie

468—FARACO, F., RODRIQUEZ, G. & PAGNOTTA, G., 1958. [Ospedali Riuniti di Napoli—Reparto Medicina Ospedale "Gesù e Maria".] "Su di un caso di cisticercosi diffusa." Acta Medica Italica di Malattie Infettive e Parassitarie, 13 (1), 5-9.

Faraco et al., after reviewing some of the more important facts concerning cysticerciasis, with particular reference to their clinical aspects, present in detail an asymptomatic case in which calcified cysts were revealed by radiography in the thorax, head, shoulder, arm and leg.

I. M. Watson

469—HUTCHISON, W. F., RICKS, Sr., H. C. & WOOLDRIDGE, D. S., 1959. [Department of Preventive Medicine, University of Mississippi School of Medicine, Jackson, Mississippi, U.S.A.] "A new record of human infection with Dipylidium caninum in the United States." American Journal of Tropical Medicine and Hygiene, 8 (5), 603.

Hutchison et al. report a case of Dipylidium caninum infection in a five-year-old white girl. Atebrin treatment caused the evacuation of five strobilae. The patient had played with two dogs of which the faeces proved negative.

W. K. Dunscombe

470—ISHII, Y. & IKEJIRI, M., 1959. [Department of Parasitology, Faculty of Medicine, Kyushu University, Fukuoka, Japan.] [A case of scrotal tumour caused by the larval form of Diphyllobothrium mansoni.] Igaku Kenkyu. Fukuoka, 29 (1), 156-158. [In Japanese: English summary p. 158.] A migratory tumour and other minor disorders of the testicles of a 17-year-old boy were cured by the removal of a larval tapeworm from the wall of the testicle. The worm measured 4.5 mm. long by 0.7 mm. broad in a fixed specimen and was identified as Diphyllobothrium mansoni. Y. Yamao

471—KAROLINSKAYA, V. N., 1959. [Kafedra epidemiologii Omskogo meditsinskogo instituta imeni Kalinina.] [Infection periods of *Hymenolepis nana* and *Lamblia* in small children in specialized nursery schools.] [Abstract.] **Meditsinskaya Parazitologiya i Parazitarnie Bolezni. Moscow, 28** (2), 232–233. [In Russian.]

Karolinskaya reports that starting from the end of the first month of admission of 100 children into a nursery school, 6-11 of them became infected with *Hymenolepis nana* each month. This infection had previously been recorded at the school in question. At the end of six months 49 out of the 100 newly admitted children were infected.

N. Jones

472-KONDRATEVA, G. P. & GORSKAYA, V. I., 1959. [Estonskaya respublikanskaya sanitarnoepidemicheskaya stantsiya.] [Home treatment of Diphyllobothrium infection.] [Abstract.] Meditsinskaya Parazitologiya i Parazitarnie Bolezni. Moscow, 28 (2), 236. [In Russian.] Kondrateva & Gorskaya recommend 0.3 gm. of Acrichin given twice in the same day, and no more than 2 gm. of male fern extract the following day, for home treatment of Diphyllobothrium infection in adults. 83% of 31 persons thus treated were cured. Important foci of Diphyllobothrium are reported from the region of the Chud and Pskov lakes.

473—LEIKINA, E. S., LUKASHENKO, N. P., ZORIKHINA, V. I., LAVRENOV, B. K. & MAMEDOV, M. M., 1959. [Sektor experimentalnoi parazitologii Instituta malyarii, meditsinskoi parazitologii i gelmintologii Ministerstva zdravookhraneniya SSSR.] [Natural foci of *Echinococcus* multilocularis in the Novosibirsk region.] Meditsinskaya Parazitologiya i Parazitarnie Bolezni.

Moscow, 28 (2), 206-213. [In Russian: English summary p. 213.]

Leikina et al. studied the epidemiology of multilocular hydatid in the Novosibirsk region. In 850 persons subjected to the Casoni test 3.06% were positive and 4.5% doubtful. 15 persons with positive reactions had pathological changes in the liver, characteristic of hydatid. The incidence of infection in different age groups was 2.8% to 3.8%. In children less than 14 years of age the reaction was negative. Investigation of the distribution of the incidence of hydatid according to occupational groups showed that 7.1% of persons in contact with natural foci (pickers of wild berries, hunters and herdsmen) were infected, in contrast to the rest of the population in which the incidence was 1.2%. Altogether, 3,828 rodents and insectivores, belonging to 16 species were examined from Barabinsk, Maslyaninsk and Kuybyshev districts. The incidence of Echinococcus multilocularis infection was, in the first district 0.88% in Ondatra zibethica and 0.36% in Microtus oeconomus, and in the second district 10.7% in Clethrionomys rutilus and 20% in M. oeconomus. No infection was detected in the Kuybyshev district. Examination of 36 dogs did not reveal the presence of the adult tapeworm. Unilocular hydatid was found in 6.4% of cattle, 23.8% of sheep and 6.7% of pigs.

474—MIYAGAWA, T., YAMADA, A., IGAKI, A. & MORISHITA, T., 1959. [Hakuai Hospital, Yonago, Tottori Prefecture, Japan.] "Röntgenologische Studien über den Echinococcus cysticus pulmonum." Yokohama Medical Bulletin, 10 (4), 206–227.

A detailed X-ray study of the lungs was made in a case of *Echinococcus* infection, before and after operation for cysts in the liver, as a contribution towards a future X-ray diagnosis of the infection. The X-ray examinations were made at intervals over a period of three-and-a-half years and aimed to study the shape and formation of the shadows in the lung, their further development and subsequent reduction, and their predilection site in the lung. G. I. Pozniak

475-SCHMID, R., 1958. [Bakteriologisches Institut des Kantons St. Gallen.] "Die Echinokokken-Krankheit in der Schweiz, 1926-1955." Acta Tropica. Basle, 15 (1), 65-81. [English & French

summaries p. 81.]

Schmid refers to Dardel's work on the geographical distribution of Echinococcus multilocularis and E. granulosus in Switzerland. The author has continued this survey from 1926 until 1955 During this period 127 cases of human hydatid of Swiss origin were recorded. 70% of these cases were due to E. multilocularis and 30% to E. granulosus. The incidence and geographical distribution of hydatid has changed very little since 1926. E. multilocularis infection was found to be most frequent in the north-east part of Switzerland. 55% of cases seen were men and 45% women. Distribution of cases according to occupation is also given. The paper is illustrated by eight tables and two maps. N. Iones

476- -SIERRA, H., FAIGUENBAUM, J. & POBLETE, O., 1959. [Hospital del Salvador y Departamento de Parasitología, Universidad de Chile.] "Hidatidosis ósea. Un caso de quiste hidatídico localizado en el omóplato." Boletín Chileno de Parasitología, 14 (2), 39-41. [English summary

Sierra et al. report the case of a hydatid swelling, the size of two fists placed in line, removed surgically from the scapula of a Chilean aged 32 years. About two years later a hydatid had grown again in the same place and only partial removal was possible. At the time of publication the patient was receiving weekly injections of hydatid antigen in an attempt to treat the destructive process which was active in the bone. M. McKenzie

477—STERMAN, M. M. & BROWN, H. W., 1959. "Echinococcus in man and dog in the same household in New York City." Journal of the American Medical Association, 169 (9), 938–940. A Greek woman immigrant to the U.S.A. and her son were infected with hydatid cysts, probably acquired in Greece in 1955 or subsequently from a dog imported by them from Greece at that time and which, two years later, was found to harbour the adult tapeworm. The authors speculate on the source of the infection and comment on diagnostic tests.

G. A. Webster

Acanthocephala

478—BECK, J. W., 1959. [Department of Microbiology, University of Miami, School of Medicine, Coral Gables, Florida, U.S.A.] "Report of a possible human infection with the acanthocephalan Moniliformis moniliformis (syn. M. dubius)." Journal of Parasitology, 45 (5), 510.

Beck reports the recovery of a mature male *Moniliformis moniliformis* from (presumably) the vomitus of a female patient during a "gall-bladder attack". No ova, larvae or adult worms were revealed by subsequent stool examination.

J. M. Watson

Nematoda

See also Nos. 527, 528, 530, 609, 611, 639, 674, 683, 826, 827, 828, 829, 831, 834, 852, 853, 858, 861, 868, 869, 872, 873, 883, 888, 914, 942, 964, 966, 969, 971, 973.

479—ANON., 1959. "Malaria, ancylostomiasis and filariasis basically eliminated in Shanghai suburbs." Chinese Medical Journal. Peking, 78 (1), 49-51.

The recent over-all incidence of ancylostomiasis was about 50% and of filariasis about 2%-5% among a population of approximately 1,400,000 in the suburbs of Shanghai. An intensive and extensive campaign of mass examination and treatment (by tetrachlorethylene in the case of ancylostomiasis and hetrazan in the case of filariasis) has led to the basic elimination of these infections in the area.

I. M. Watson

480—ANON., 1959. "Preliminary survey of filariasis in Shantung Province." [Abstract.] Chinese Medical Journal. Peking, 78 (2), 178–179.

67 hsiens were surveyed and 52 were found positive, the heavily infected ones all being in the south. 123,121 persons were examined; the maximum filarial rate was 26%, the minimum 0.03%, with an average of 7.1%. Wuchereria bancrofti was the predominant species; 22 species of mosquito were found but 94% of the specimens were Culex pipiens var. pallens. All stages of larvae were found in these, but only immature larvae were found in Anopheles hyrcanus var. sinensis and only unsheathed larvae in Culex tritaemiorhynchus. C. pipiens var. pallens was positive from mid-June to September but negative in May and October. N. A. Hancock

481—ATÍAS, A. & RAMÍREZ, M., 1959. [Departamento de Parasitología, Universidad de Chile.] "Oxyuriasis: ensayo terapéutico con hexahidrato de piperazina en cuatro días de tratamiento." Boletín Chileno de Parasitología, 14 (2), 28–29. [English summary p. 28.]

Boletín Chileno de Parasitología, 14 (2), 28–29. [English summary p. 28.] 38 people in six families infected with *Enterobius vermicularis* at La Serena, Chile, were given piperazine hexahydrate for four consecutive days in single daily doses of 2 gm. or 3 gm. according to age, administered on an empty stomach. The Graham swab test subsequently showed 23 to be free of infection. Two people eliminated *Ascaris*.

M. McKenzie

482—BARSKI, I. P. & RASTORGUEV, S. N., 1959. [Stalinogorski gosudarstvenni khimicheski kombinat.] [An apparatus for the treatment of ascariasis with gaseous oxygen.] Meditsinskaya Parazitologiya i Parazitarnie Bolezni. Moscow, 28 (1), 99-100. [In Russian.]

Barski & Rastorguev have constructed an apparatus for the treatment of ascariasis with gaseous oxygen, introduced into the intestine under pressure. The main features of the apparatus, a diagram of which is given, are: an oxygen cylinder, a pressure vessel and a rubber sack. The oxygen pressure can be regulated, excess leaving the circuit through a safety valve. In 86% of 165 persons treated with the help of this apparatus good results were obtained.

N. Jones

483—BIOCCA, E. & PAGGI, L., 1959. [Istituto di Parassitologia dell'Università di Roma.] "Infestazione sperimentale di Ovis aries con larve di trichostrongili umani provenienti dall'Iran." Parassitologia.

Rome, 1 (1), 68-75.
Following on Biocca's paper [for abstract see No. 431 above] the authors consider that many persons are infected with *Trichostrongylus* in Iran. Experimental infection of two lambs with larvae obtained by culture from the emulsified faeces of ten patients in Teheran and ten in Isfahan led to the recovery of numerous adult *Trichostrongylus* from the small intestine when the lambs were killed two months later. The worms appeared to be *T. orientalis*.

W. K. Dunscombe

484—BONEBAKKER, A. & BERG, J. A. G., TEN, 1958. "A case of onchocerciasis." Tropical and Geographical Medicine. Amsterdam, 10 (3), 283–287. [Discussion pp. 287-288.]

485—BOVORNKITTI, S. & TANDHANAND, S., 1959. [Department of Medicine, Siriraj Hospital Medical School, Dhonburi, Thailand.] "A case of spontaneous pneumothorax complicating gnathostomiasis." Diseases of the Chest. Chicago, 35 (3), 328–331.

This case is described in considerable detail with a diagram and three radiographs of the thorax. Although all search for parasites was negative, skin tests for gnathostomiasis were strongly positive; and eosinophilia associated with recurrent migratory cutaneous swellings is said to be characteristic. The patient recovered without treatment. The authors speculate on the possible sequence of events.

J. M. Watson

486—CH'EN, T. T. ET AL., 1959. [Nanking Army Hospital.] "Further observations on intensive treatment of filariasis with hetrazan." [Abstract.] Chinese Medical Journal. Peking, 78 (2), 173. 375 filarial cases (mainly bancroftian but some malayan and a few mixed) were treated with hetrazan under seven different regimes, the largest being 3·0 gm. given in a day and the smallest 1·5 gm. given in ten hours. All treatments proved satisfactory. The larger doses gave better results on microfilariae but there was no evidence of a better effect on adult worms. Patients given a single dose not exceeding 0·5 gm. showed the best tolerance. A regime of 0·5 gm. every four hours with a total of 1·5 gm. or 0·5 gm. twice a day for two days, was recommended.

487—CH'EN, T. T. ET AL., 1959. [Nanking Army Hospital.] "Preliminary observations on intensive hetrazan treatment of filariasis." [Abstract.] Chinese Medical Journal. Peking, 78 (2), 174. Ch'en et al. mention previous trials in 1953 and 1954, and report on 1–2 day intensive treatment of 121 cases. Four doses of 0·5 gm. in two days or four doses of 0·4 gm. in one day were given. These schedules removed microfilariae and adults in most patients. Many dead male and female worms were found in excised lymphatic nodules and the rate of clearance of microfilariae was 60–100%. The authors believe that salicylic acid given together with hetrazan would reduce the reaction which is severe with malayan filariasis.

N. A. Hancock

488—CHIN, T. H., HO, K. P. & LI, M. K., 1959. [Kweiyang Medical College.] "The incidence of filariasis in Kweichow Province." [Abstract.] Chinese Medical Journal. Peking, 78 (2), 176. The disease was found to be distributed in the eastern part of the province, which may be subdivided into north and south sectors. In the north, Wuchereria bancrofti is prevalent (10-20% incidence) with Culex fatigans as the main vector, although the authors consider that Anopheles hyrcanus var. sinensis and Culex tritaeniorhynchus might play a secondary role, as yet not demonstrated. In the south sector, W. malayi is prevalent (10% incidence generally, some of 30-50%) with Anopheles hyrcanus var. sinensis as the chief vector. Occasional mixed infections were found.

489—CHU, S. H. Et al., 1959. [Chung Shan Medical College.] "Filariasis in Ts'unghua, North Kwangtung." [Abstract.] Chinese Medical Journal. Peking, 78 (2), 177.

A total of 5,599 persons examined showed a microfilarial infection rate of 11.9% (666 positive). Wuchereria bancrofti was the only form found. 2,229 adult Culex fatigans showed a positive infection rate of 10.5%.

N. A. Hancock

490-ERMOLOV, V. I., 1959. [Novocherkasskaya sanitarno-epidemiologicheskaya stantsiya.] [Comparative evaluation of methods of peri-anal scraping and washing in the diagnosis of enterobiasis.] Meditsinskaya Parazitologiya i Parazitarnie Bolezni. Moscow, 28 (1), 99. [In Russian.] Ermolov examined 131 children aged three to eight years by peri-anal scraping and by swabbing with small brushes dipped in 10% glycerin. Scraping revealed eggs of *Enterobius vermicularis* in $51\cdot1\%$ and eggs of *Hymenolepis nana* in $3\cdot7\%$ of the cases examined. The brush method established the presence of E. vermicularis in 60.3% and of H. nana infection in 6.8% of the cases examined. N. Iones

491—FIGUEIRA, F., COUTINHO, J. D., MATTAR, G. & ROCHA, H. S., 1957. "Notas sôbre dados hematológicos na ancilostomose da criança." Pediatría Prática. São Paulo, 28 (11),

497-504. [English summary p. 503.]

Figueira et al. report clinical observations on two children infected with Ancylostoma. In one with an exceedingly heavy infection there was no eosinophilia until after treatment, when the eosinophil count rose sharply to 34%. The other child had a moderate infection but showed, during the first month after admission to hospital, an eosinophil count of 65-75% which dropped after treatment. C. A. Wright

492—HASSAN, M. Y. B., 1959. [Kedah Health Department, Malaya.] "The filariasis campaign in Kedah." Medical Journal of Malaya, 14 (1), 36-46.

The filariasis campaign in Kedah was started by a house to house census in the Mukim of Bukit Berangan. This showed that the rate of infection fluctuated between 20% and 40% and was highest (54.5%) in males in the 35 to 39 age group. Children under two years were not infected. Examination after seven to twelve months showed that mass treatment with diethylcarbamazine dihydrogen citrate at doses of 5 mg. per kg. body-weight weekly for six weeks (total dose 30 mg. per kg.) had reduced the infection rate from 26% to 1.47% and the density of larvae in 20 cu. mm. of blood from 2.6 to 0.18. The treatment was repeated in unsuccessful cases. Side reactions lasting two to three days were observed, particularly in cases showing microfilaraemia, and lymphangitis and adenitis tended to develop during the third and fourth week of treatment.

493—HAYASHI, S. ET AL., 1959. [Department of Parasitology, Institute for Infectious Diseases, University of Tokyo.] "Studies on the epidemiology of pinworm (*Enterobius vermicularis*) in Japan." Japanese Journal of Experimental Medicine, 29 (4), 213–250.

Hayashi et al. carried out an epidemiological survey of Enterobius vermicularis infection in Japan involving 3,048 people. The methods used were single or repeated Scotch tape swab tests, in some cases concurrently with coprological examinations (for other parasites). The results thus obtained were subjected to corrections, bringing their value to the theoretical equivalent of six to seven such tests and then interpreted statistically with the X^2 test. The incidence of infection was 20% to 49.2% among children attending kindergartens and 12.5% to 59.6% among the general population. Sex, social standards, occupation, climate, dressing habits and the presence of other common parasites appeared to have no important bearing on the incidence of enterobiasis. Age, however, was important, incidence being maximal in the five to nine-year-old group and secondary peaks occurring at 40-49 years in men and at 30-39 years in women. The incidence was inversely related to the bedroom space. Distribution of the infection was found to be familial and to be related to the size of the family. The general route of infection was from children to mother and from mother to father. It was concluded, from an experiment involving piperazine-treated and uninfected children and adults, that the main source of infection was the kindergartens. The authors suggest therefore that treatment and prevention of enterobiasis among five to nine-year-old children attending kindergartens or primary schools is one of the most effective and convenient methods N. Jones of control of enterobiasis in any given area.

494—HOCK, C. C., 1959. [Department of Parasitology, University of Malaya.] "Ascaris in the right lacrimal duct of a child." Proceedings of the Alumni Association, Malaya, 12 (2), 109-110. Hock reports on the finding of an immature specimen of Ascaris in the right lachrymal duct of a three-year-old boy. Diagnosis was made after examination of a 2 mm. long anterior portion

of the worm, where a tri-radial lumen of the oesophagus and three lips typical of Ascaris lumbricoides were found.

N. Jones

495—HUGHES, M. H., 1959. [Public Health Laboratory, Royal Hampshire County Hospital, Winchester, Hants, U.K.] "Onchocerca volvulus in the human eye." [Correspondence.] Transactions of the Royal Society of Tropical Medicine and Hygiene, 53 (3), 301.

Hughes points out that Rodger (1959), in his paper on the distribution of microfilariae of Onchocerca volvulus in the eye of man, has overlooked the record of a section showing a fragment of an O. volvulus microfilaria in the optic nerve which was presented by Hughes & Daly (1950) at a laboratory meeting of the Royal Society of Tropical Medicine and Hygiene. G. I. Pozniak

496—IRVINE, W. C. & IRVINE, Jr., A. R., 1959. [272 South Lake Street (57), Los Angeles, California, U.S.A.] "Nematode endophthalmitis: Toxocara canis. Report of one case." American Journal

of Ophthalmology, 47 (5, Part 2), 185–191.

Irvine & Irvine, after quoting an extensive bibliography, give a detailed description of a human case of endophthalmitis caused by *Toxocara canis*. The larva of this parasite was found in a necrotic abscess involving the ora serrata and pars plana. It is concluded from the absence of choroidal involvement that the infection occurred via the terminal arterioles of the retinal vasculature. The paper is supplemented with numerous photomicrographs.

N. Jones

497—KARIKS, J., 1958. "Tropical pulmonary eosinophilia." Medical Journal of Australia, 45th Year, 2 (23), 773–775.

Kariks reported that five patients with tropical pulmonary eosinophilia, three of whom showed microfilariae in the blood, were successfully treated with hetrazan.

W. P. Rogers

498—KESSEL, J. F., 1958. [School of Medicine, University of California at Los Angeles, California, U.S.A.] "Uveitis caused by helminths and protozoa." Archives of Ophthalmology, 59 (6), 854–860.

Kessel reviews the occurrence of animal parasites in the uveal tract of man. The helminths reported are all developmental forms represented on the one hand by microfilariae of *Onchocerca* and possibly *Wuchereria* and on the other hand by migrating larvae of other Nematoda. In the latter case occurrence in the uveal tract is probably incidental to visceral larva migrans, most frequently caused by *Toxocara canis*.

J. M. Watson

499—KOZAR, Z., 1959. [Zakład Parazitologii, Polska Akademia Nauk, Warszawa, Poland.] "Problem włośnicy w Polsce i plan zwalczania tej inwazji." Wiadomości Parazytologiczne, 5 (2/3), 265–280.

[Also in English pp. 280-291.]

Kozar, reviewing the problem of trichinelliasis, concludes that an unfavourable epidemiological situation exists in Poland. Over the 13 post-war years about 5,237 human infections have been recorded, $2\cdot13\%$ of them fatal. Two-thirds of these reports came from the Warsaw and Białystok districts; these data do not include the three large epidemics in Raciborz (1947), Płock (1955) and Bydgoszcz (1957). A survey using intradermal tests showed as much as 38% of the population to be affected in Białystok. The infection in pigs is probably the highest in Europe and has been reported also from other domestic and many wild animals. Kozar calls for energetic support of his plan of control proposed three years previously and outlines the action to be taken.

500—KUNG, C. C., 1959. [Military Academy of Medical Sciences.] "Epidemiology of human filariasis in China. Its distribution and transmission." [Abstract.] Chinese Medical Journal. Peking, 78 (2), 176-177.

Kung reports that about 20 million people in China are infected with Wuchereria bancrofti and W. malayi. The distribution of the two types is listed. Two forms of the vector Anopheles hyrcanus sinensis are mentioned, one similar to A. sinensis Wied, 1928 and the other to A. lesteri Baisas & Hu, 1936. The first form is responsible for transmission of malayan filariasis in low-lying areas, the second in mountainous districts of south China. Both were shown experimentally to be very susceptible to W. malayi infection but in Malaya, Anopheles sinensis Wied is reported to be refractory to such infection. In plains and coastal areas, Culex

pipiens var. pallens (in north China) and C. fatigans (in the south) are the main vectors of W. bancrofti, but both culicine and anopheline mosquitoes are found in houses, and have been shown to be favourable for W. bancrofti development. In coastal areas, Aëdes togoi assists in the transmission of W. bancrofti and W. malayi, as may Mansonoides uniformis. Aëdes jeyporiensis var. candidiensis was found to harbour malayan filariae in Fukien province.

N. A. Hancock

501—KUNG, C. C., CHANG, C. L., HSÜ, A. N. & SUN, P. C., 1959. [Military Academy of Medical Sciences.] "Epidemiologic studies of filariasis in Chentse hsien, Kiangsu Province. I. A brief survey of the infection." [Abstract.] Chinese Medical Journal. Peking, 78 (2), 177.

This survey was made mainly in Tungzhan peninsula of the *hsien* and both bancroftian and malayan infections were found. 2,377 villages were surveyed; 318 (13·4%) were positive. Of these, 39·3% showed bancroftian alone, 43·4% malayan and 17·3% mixed infection. Malayan filariasis was more prevalent in the south of the peninsula, bancroftian in the north, and mixed infections in the middle region. In mixed cases from the north, more bancroftian than malayan filariae were found and vice versa in the south, whilst in the middle such cases had equal numbers of the two types. Microfilariae of *Wuchereria malayi* showed the greatest intensity of infection, then mixed infection, and *W. bancrofti* least.

N. A. Hancock

502—KUNG, Y. L. & WANG, W. C., 1959. [Provincial Institute for the Control of Endemic Diseases, Anhwei.] "Hetrazan as an aid in the diagnosis of filariasis malayi." [Abstract.] Chinese Medical Journal. Peking, 78 (2), 172.

Kung & Wang suggest that administration of small doses of hetrazan might be helpful in the diagnosis of filariasis malayi. In a filariasis endemic village in northern Anhwei 25–100 mg. of hetrazan were administered to villagers under survey. Of 209 cases positive for microfilariae, 163 (78%) showed allergic reactions, while only 49 (6·1%) of 800 cases negative for microfilariae showed such reactions. Positive cases showing no reaction generally harboured only one to ten microfilariae per 60 cu.mm. of blood.

J. M. Watson

503—LAMY, L. & GIRARD, G. G., 1959. [Institut Pasteur, Service de Parasitologie et Clinique des Quinze-Vingts.] "Observation d'un cas de filariose oculaire en France." Bulletin de la Société

de Pathologie Exotique, 52 (1), 28–29.

Lamy & Girard describe a filaria removed from the sub-conjunctival space in a Parisian woman who had never left Metropolitan France. She had, however, spent her holidays in the south of Bouches-du-Rhône. This, as previous records show, is a region where Dirofilaria immitis and D. repens occur in dogs. No microfilariae were found, indicating that man is an accidental host. The authors agree with Desportes that there are no decisive reasons for separating D. repens and Filaria conjunctivae and that, if not the same, these are very closely related species and that the name D. conjunctivae should be used.

S. Willmott

504—LEVENSON, E. D., 1959. [Institut malyarii, meditsinskoi parazitologii i gelmintologii Ministerstva zdravookhraneniya SSSR.] [Methods for the control of ascariasis in the U.S.S.R.] Meditsinskaya

Parazitologiya i Parazitarnie Bolezni. Moscow, 28 (3), 343-345. [In Russian.]
Levenson agrees with Isaev on the existence of two types of foci of ascariasis [for abstract see Helm. Abs., 27, No. 133a]. While he agrees with Isaev on mass examination and treatment, he stresses the importance of prophylaxis in its control and considers sociological factors as of cardinal importance in the formation of foci.

N. Jones

505—LI, H. H., 1959. [Shantung Provincial Antifilariasis Bureau, Shantung, China.] "Prevention and treatment of filariasis in Shantung province." Chinese Medical Journal. Peking, 78 (1), 52–54. Li gives an outline of the anti-filariasis campaign in Shantung Province where 7·1% of the population has been found positive for microfilariae. Culex pipiens var. pallens is the chief, and in some places the only, vector. In an experimental area mass examination of the population was followed by treatment of the population with hetrazan alone or hetrazan combined with carbarsone; fumigation with 666 was done to kill adult mosquitoes in winter, spraying with 666 to kill larval mosquitoes in spring and interior residual spraying of houses with 666 and D.D.T. to reduce the number of mosquitoes in the homes. The success of this work

encouraged its extension. By the end of August, 1959, 2,700,000 people had been examined and 90,000 treated. By the end of the year filariasis should have been basically eliminated throughout the province.

J. M. Watson

506—LI, H. H., 1959. [Provincial Institute for the Control of Filariasis, Shantung, China.] "Studies on filariasis in New China." Chinese Medical Journal. Peking, 78 (2), 148–160. Li gives an account of the results of researches made on filariasis in recent years in China

under the following heads: species of filaria and their distribution; prevalence and manifestations; sex and age in filarial infection; deteriorating effects; vector species; endemic factors; diagnosis; treatment; control of vectors. Much statistical information is scattered through the text. The surveys, epidemiological investigations, mass treatment and antimosquito campaigns of the past nine years have brought about a state of affairs in which filariasis has been basically eradicated in 38 hsiens and its elimination from the country is anticipated in the immediate future. [This paper ably summarizes the present status of antifilariasis work in China and merits perusal in the original.]

J. M. Watson

507—LI, L. S., HSIAO, C. Y., HO, Y. & K'UNG, T. L., 1959. [86th Army Hospital.] "Studies on the dosage and effect of hetrazan upon filariasis." [Abstract.] Chinese Medical Journal. Peking, 78 (2), 175.

Observations are made on follow-up examinations of 158 cases of bancroftian and malayan filariasis treated with short course hetrazan, 50 cases of bancroftian filariasis treated with carbarsone and hetrazan, and the effect of oral administration and local injection of hetrazan on microfilariae in lymphatic channels and hydroceles. Treatment with 0·3 gm. hetrazan thrice daily for five or three days was quite satisfactory. Thick blood smears showed that 71·9–88·9% of patients were negative six months later and the microfilarial count in those positive was reduced by 94%. Although microfilariae were removed from the peripheral blood, many were found in the lymph and chyle fluid, and local injections had no effect. There was no evidence that carbarsone administered simultaneously with hetrazan produced any improvement, and diurnal or nocturnal dosage with hetrazan made no difference.

N. A. Hancock

508—LLOYD, E. L., 1959. [Tropical Diseases Unit, Eastern General Hospital, Edinburgh, Scotland.] "Struggles with Strongyloides." Practitioner, 182 (1092), 740.

Lloyd reports the successful treatment of 27 patients suffering from strongyloidiasis with

Lloyd reports the successful treatment of 27 patients suffering from strongyloidiasis with 200 mg. of dithiazanine three times daily for 21 days. Larvae disappeared from the stools three days after commencement of treatment, and urticaria ceased.

J. M. Watson

509—MA, H. C., YEH, Y. C. & TS'AO, C. C., 1959. [Tsingtao Medical College.] "Intradermal tests with *Dirofilaria immitis* antigen in diagnosis of filariasis." [Abstract.] **Chinese Medical Journal. Peking, 78** (2), 173.

Antigen produced from *Dirofilaria immitis* by the slightly modified method of Bozicevich & Hutter was used. 0.03 ml. of a 1:8,000 dilution was injected intradermally into the volar surface of one arm and the same amount of similarly diluted serum from a filaria-free dog into the other arm. An antigen wheal at least 3 mm. larger than the control was considered positive when reactions were read 10 and 20 minutes later respectively. 200 out of 201 filarial subjects were positive. However, 84 non-filarial cases with ascaris, hookworm or whipworm were positive, and 98 similar cases from non-endemic areas showed 83 positive and 15 negative reactions. 17 parasite-free cases gave nine negative and eight positive reactions. Thus the authors consider that the test is unsatisfactory.

N. A. Hancock

510—MARTINI, I., 1959. [Istituto Zooprofilattico Sperimentale, Teramo, Italy.] "Dati recenti ed interessanti sulle trichine e sulla trichinosi." Veterinaria Italiana, 10 (2), 145–157. Martini reviews some of the recent literature concerning trichinoscopy at various developmental stages and the treatment of trichinous meat. Relating to this latter subject, the author makes special reference to the work of Varges on the effect of cold on trichinellae [for abstract see Helm. Abs., 24, No. 263a].

N. Jones

511—MISHRA, S., 1958. [Balbhadrapur, India.] "Intravitreal parasite." Archives of Ophthalmology, 60 (5), 945–946.

Mishra reports a case, still under observation, of a 21-year-old Hindu man in whom ophthal-moscopic examination revealed a filariform parasite about 15 mm. long in the vitreous humour of the right eye, which was provisionally identified as an adult *Wuchereria bancrofti* in view of the wide-spread local prevalence of this species. Blood, urine, sputum, stool and skin examinations for parasites were negative, but there was mild eosinophilia and a history of recurrent scrotal inflammation. No anthelmintic treatment was given.

J. M. Watson

512—NAIR, C. P. & ROY, R., 1958. [Malaria Institute of India, Delhi, India.] "Filariasis in Kerala State. Part IV. Filaria survey of Eriyad Panchayat, Cranganore Taluk." Indian Journal of

Malariology, 12 (3), 195–201.

Nair & Roy report on the results of parasitological and clinical surveys of filariasis in Panchayat (Kerala State) in 1957. Altogether 1,787 persons were examined and the only prevalent species found was Wuchereria malayi. The over-all incidence of infection was 11.02% and it rose steadily until the age of 20. The intensity of infection ranged from 1 to 114 microfilariae per 20 cu.mm. of blood and averaged 10.4 microfilariae per 20 cu.mm. The over-all incidence of disease was 11.20%; it rose with age from 1.5% in the two to five-year-old-group to 22.2% in the 51-year-old-group. Of 16 infants examined only one was infected and had a swelling of the right arm. The over-all endemicity rate was 21.15%. 423 anopheline and culicine specimens were examined and Mansonioides annulifera was found to be the main vector, with an incidence of infection of 2.6%; M. uniformis was incriminated as a secondary vector but the other mosquito species were found to be free from infection.

513—OYTUN, H. S. & GÜRALP, N., 1959. [University of Ankara, Faculty of Medicine, Department of Parasitology.] "Taxonomic research on the etiology of hookworm disease occurring on the shores

of the Black Sea, Turkey." Acta Tropica. Basle, 16 (1), 76-77.

Oytun & Güralp investigated the hookworm problems of the Turkish provinces on the shores of the Black Sea during the summer of 1951. A total of 1,869 hookworms was collected from the stools of 55 female and six male patients, ten to fifty years old. Of these 1,791 (95·83%) proved to be *Necator americanus* and 78 (4·17%) *Ancylostoma duodenale*. The former parasite occurred alone in 48 (78·69%) of the 61 patients, while both species were found in the other 13 persons.

J. M. Watson

514—PARODI, L., 1958. [Service de Santé des Tr. O. M. Chirurgien des Hôpitaux Coloniaux.] "Sur les syndromes gastro-duodénaux et péritonéaux de l'ankylostomiase." Médecine Tropicale, 18 (6) 937-942

Parodi reports on ten clinical cases of ancylostomiasis with gastro-duodenal and peritoneal syndromes. The symptoms consisted of pains in the umbilical region, vomiting, diarrhoea, constipation, anorexia and tetanic attacks. The body temperature varied from 35.5°C. to 38.9°C. The number of red blood cells ranged from 3,500,000 to 4,300,000. The percentage of eosinophils was 6 to 18. Treatment consisted of Désoïne (alkaline desoxybenzoin) at a total dose of 26–80 tablets divided over eight daily doses. The symptoms abated two to four days after the beginning of treatment. In addition to Ancylostoma eggs in the faeces, Ascaris eggs were found in two cases and eggs of Strongyloides in one. In this latter case the eggs of both nematodes reappeared three months after the second treatment. In all the other cases the faeces were rendered negative by the first, the second or the third treatment. In the cases of double infection the syndrome was always attributed to Ancylostoma.

515—PATEL, T. B. & PARANJPEY, P. B., 1958. [Director of Public Health, Bombay State.] "Observations on mass therapy with diethylcarbamazine (hetrazan) for filaria control in Bombay State."

Indian Journal of Malariology, 12 (3), 171–182. Patel & Paranipey report that filariasis in the Bombay State is entirely of bancroftian type. As a prophylactic measure diethylcarbamazine was given at a daily dose of one to two 100 mg. tablets for five days. 29% of those thus treated had such side effects as fever, headache, body pains, diarrhoea, constipation and vomiting, which were reduced by the administration of a sodium bicarbonate-calcium lactate mixture. More serious toxic symptoms such as ocular

swellings, abscess formation, acute glandular swellings, retention of urine, jaundice, abdominal pains, etc., were rare. Whether the drug was taken on a full or empty stomach appeared to have no influence on the incidence of side effects, but it did affect their nature somewhat. To assess the results of diethylcarbamazine treatment on filariasis the blood of 70 persons in the Surat area and 97 persons in the Nagpur area was examined. Before the treatment the average microfilarial count was 18·4 per 20 cu.mm. of blood in the first group and 38·1 per 20 cu.mm. in the second group. Three to four months after the treatment the mean microfilarial count was found to have been reduced by 83% in the first group and by 76·3% in the second. The respective percentages of persons completely freed from microfilariae were 38·3% and 17·5%. Microfilarial counts were higher after the therapy in 11·4% of persons of the Surat group and in 7·2% of persons of the Nagpur group. In addition to these results, 9% of 30,427 persons who took the drug in Surat passed roundworms. Residual spraying against the vector mosquitoes was also carried out.

516—PROST, E., 1959. [Wydział Weterinaryjny Wyższa Szkoła Rolnicza, Lublin, Poland.] "Badania nad występowaniem utajonej włośnicy u ludzi w Polsce." Medycyna Weterynaryjna, 15 (4), 217–220. [German & Russian summaries pp. 219–220.]

Diaphragm samples from 601 humans, who had died of other causes in Warsaw, Lublin and Katowice in Poland, were examined for trichinelliasis and in 13 a latent infection was detected. The number of larvae in a sample varied from one to 305. The cysts were heavily calcified and occasionally the larvae were calcified also. Trichinoscopy detected infection in all 13 cases but the digestion method was negative in three. Prost suggests that the digestion method, in contrast to trichinoscopy, distinguishes the presence of live larvae.

G. I. Pozniak

517—RAGHAVAN, N. G. S., NAIR, C. P. & KRISHNAN, K. S., 1958. [Malaria Institute of India, Delhi, India.] "Filariasis in Travancore-Cochin (Kerala State). Part III. Hill-tribe settlements in Quilon and Trivandrum districts." Indian Journal of Malariology, 12 (3), 183–193. Raghavan et al. report that, as a result of the examination of 471 persons in the Quilon and Trivandrum districts (Kerala State), it was found that the only agent of filariasis in those districts was Wuchereria malayi which showed nocturnal periodicity. The investigations were carried out in December, 1956 and in February, 1957. The respective infection, disease and endemicity rates were 25.9%, 28.9% and 46.3%, 7.9% showed disease and infection simultaneously. The incidence of disease was based on inquiries. Three years was the youngest age at which infection was noted. Incidence rose with age to a maximum of 36.5% at 30 years (average for both sexes). Over that age it remained more or less static. The mean density of microfilariae for all the people examined was 416 per 20 cu.mm. of blood. This, as well as the incidence of infection, was lower in women than in man. Dissection of 1,392 specimens belonging to 13 anopheline and 14 culicine species showed that Mansonioides uniformis was the vector. It entered human dwellings mostly during the early hours of the night. Local reports indicate that filariasis is autochthonous in these districts.

N. Jones

518—ROJAS, C., 1959. [Servicio de Cirugía, Hospital Regional, Traiguén.] "Infección parasitaria apendicular por Enterobius vermicularis." Boletín Chileno de Parasitología, 14 (2), 26–28. [English summary p. 26.]

At the hospital of Traiguén, the contents of the appendix were examined in 1,020 cases of chronic appendicitis in which the appendix had been removed by surgery, between the years 1954 and 1957. *Enterobius vermicularis* was found in the contents of 11.5%. M. McKenzie

519—ROOK, H. DE & DIJK, W. J. O. M. VAN, 1959. [Institute of Tropical Hygiene & Geographical Pathology, Amsterdam.] "Changing concept of Wuchereria bancrofti transmission in Netherlands New-Guinea." Tropical & Geographical Medicine. Amsterdam, 11 (1), 57-60. [Spanish summary p. 60.]

The work of de Rook and of van Dijk in areas where highly endemic filariasis exists in the absence of endemic malaria (Berau region, Bamgi-Ia area) has shown that anopheline mosquitoes are not the only vectors of bancroftian filariasis in Netherlands New Guinea. The following non-anopheline species have drawn attention: Culex fatigans, C. bitaeniorhynchus,

C. annulirostris, C. squamosus, Aëdes kochi, Mansonioides uniformis and M. papuensis. M. uniformis and C. annulirostris (1·3% and 1·6% naturally infected in the Berau region) appear to be the next most important competitors while C. fatigans, which is a recently imported species and has already appreciably multiplied in urban areas, presents an increasing danger. Some of the results quoted in this paper are drawn from work done by de Rook in 1957 and by van Dijk in 1958.

520—SELIVANOV, K. P., 1959. [Methods for the control and eradication of ascariasis. (A discussion).] Meditsinskaya Parazitologiya i Parazitarnie Bolezni. Moscow, 28 (2), 216–221. [In Russian.]

Selivanov, in his discussion of methods of control and eradication of ascariasis criticizes the work of Isaev [for abstract see Helm. Abs., 27, No. 133a]. Instead of the two types of foci proposed by this author, Selivanov proposes four types based on the occupational groups of the population, on whether products contaminated with ascarid eggs reach different inhabited areas, and on whether such products are received from elsewhere. The new foci are (i) "closed focus", (ii) "spreading focus", (iii) "external focus" and (iv) "mixed focus" which combines the preceding three. The author points out that the methods of control of ascariasis should be based on prophylaxis and not on mass treatment.

521—T'ANG, C. H., HSÜ, P. C. & CHANG, W. Y., 1959. [Nanking Medical College.] "A clinical study of filariasis with observations on microfilariae *in vitro*." [Abstract.] **Chinese Medical Journal. Peking, 78** (2), 175.

49 cases of filariasis bancrofti were studied, 48 of them asymptomatic. Before treatment, microfilariae in vitro lived up to 13 days in a solution containing one part of blood to nine of saline, for 10 days in one part of serum and nine of saline, and died slowly in normal saline or 5% glucose. For treatment, 39 cases were given 5% gm. of hetrazan in three weeks, and 10 cases given 1% gm. hetrazan with 10 gm. carbarsone in 10 days. Reactions are listed. The first group showed a better immediate result (82%) than the second (10%). The long term therapeutic effects were somewhat similar, but the first group was again slightly better.

N. A. Hancock

522—TATARINOV, A. L., 1959. [The Chinese drug 'Chuanlianpian' for the treatment of ascariasis in children.] Meditsinskaya Parazitologiya i Parazitarnie Bolezni. Moscow, 28 (2), 221–223. [In Russian: English summary p. 223.]

Tatarinov used 50 mg. Chuanlianpian tablets, 50% of the weight being that of the active drug, in the treatment of ascariasis in 880 children one to 16 years old. The drug is prepared from the bark of roots of bitter Sychuan melia (Melia azedarach). It is said to have a high proportion of neutral balsam which has a powerful ascaricidal effect. According to the age, each child received 2 to 11 tablets, divided into two doses. The results were controlled by recording the number of expelled worms and by faecal examinations for 10–14 days after treatment. 77·3% of children were freed from ascarids. Side effects in the form of nausea, dry mouth, weakness and epigastric pains were observed in 59 children for two to four hours after treatment. A co-infection with enterobiasis was cured in 40·4% of 47 of the treated children. The drug is also said to be efficacious against tapeworm infection. According to some Chinese authors a decoction of Melia azedarach trunk bark had 36% efficacy against ascarids while that of root bark had 78%.

523—WANG, Y. H., 1959. [Shantung Medical College.] "Filariasis and its transmitters among the Li nationals in Paisha hsien, Hainan Island." [Abstract.] Chinese Medical Journal. Peking, 78 (2), 180.

Of 580 persons examined, 129 were positive for microfilariae, all of which were Wuchereria bancrofti. The infection rate was 13·3-47·4%. One species of Culex, one of Armigeres and eight of Anopheles were found. Only A. minimus, A. jeyporiensis var. candidiensis and A. leucosphyrus had filarial embryos, all with infective stages. A. minimus constituted 90% of mosquitoes in houses.

N. A. Hancock

524—WANG, Y. S. ET AL., 1959. [201st Army General Hospital.] "Filariasis. Clinical analysis of 2,621 cases." [Abstract.] Chinese Medical Journal. Peking, 78 (2), 174. 2,621 filariasis cases, mainly asymptomatic with only 24·21% showing physical signs, gave negative results with three consecutive thick blood smear examinations. However, 4.9% showed microfilariae in concentrated venous blood, suggesting that repetition of such examinations are necessary on patients from endemic areas. The patients were given one of three types of treatment: (i) 0.2 gm. hetrazan thrice daily for 10 days; (ii) 0.5 gm. carbarsone twice daily for 10 days; (iii) 0.05 gm. hetrazan and 0.5 gm. carbarsone twice daily for 10 days. Carbarsone alone had no effect on microfilariae, hetrazan was faster and more complete. Follow-up examinations on 113 cases over three months and on 102 cases over one year showed that 7.9% and 3.9% respectively still had microfilariae. Side reactions were more pronounced in group (i) than group (iii), but in group (ii) were relatively mild.

525—WANG, C. P., CHU, C. H. TENG, S. Y. & HU, K. C., 1959. [Kiangsi Medical College.] "An investigation into the epidemiology of filariasis in Tiehlu hsiang, Fengch'eng hsien, Kiangsi Province." [Abstract.] Chinese Medical Journal. Peking, 78 (2), 179.

614 persons were examined; 82 were positive for microfilariae in the blood and 52 more showed symptoms but had negative blood slides. Of the positive cases, 69 had Microfilaria malayi, eight Mf. bancrofti and five mixed infections. It is considered that the two latter groups contracted the bancroftian infection elsewhere. 13 species of mosquito were found; Anopheles hyrcanus var. sinensis was the commonest and the only one infected. 210 of them were dissected; nine were positive for filarial embryos and two for infective larvae, all being Mf. malayi. N. A. Hancock

526—WANG, Y. H. & LU, P. Y., 1959. [Shantung Medical College.] "Complement fixation test in filariasis. A preliminary report." [Abstract.] Chinese Medical Journal. Peking, 78 (2), 173. Antigen prepared from adult Dirofilaria immitis was tested against 110 sera from cases of filariasis bancrofti. 96 gave positive and 14 negative reactions. 127 controls from non-filarial patients and 15 healthy individuals gave 128 negative reactions and 14 positive (including four patients with paragonimiasis and one with ascariasis). Wang & Lu conclude that the test is of especial use in diagnosis of cases with lymphatic obstruction giving negative blood film examinations. N. A. Hancock

Nematomorpha

No relevant abstracts in this issue

Hirudinea

See No. 546.

Pentastomida

No relevant abstracts in this issue

Miscellaneous

See also Nos.: 858, 869, 980.

527-AUGUSTINE, D. L. & NEVA, F. A., 1958. [Harvard School of Public Health, Boston, Mass., U.S.A.] "The diagnosis and treatment of intestinal parasitism." Medical Clinics of North America, 42 (5), 1387-1399.

Augustine & Neva discuss the diagnosis and treatment of the commoner intestinal parasitic diseases indigenous to continental North America, and those likely to be acquired with foreign travel and residence. Among those included are enterobiasis, ascariasis, trichuriasis, ancylostomiasis, strongyloidiasis, trichinelliasis, hymenolepidiasis, diphyllobothriasis, taeniasis and schistosomiasis. J. M. Watson 528—DERBENEVA-UKHOVA, V. P. ET AL., 1959. [Work of the Sanitary Epidemiological Service in control of parasitic diseases in various zones of the U.S.S.R.] Meditsinskaya Parazitologiya i

Parazitarnie Bolezni. Moscow, 28 (3), 287–194. [In Russian.] Derbeneva-Ukhova et al., in their discussion of the work of the Sanitary Epidemiological Service of the U.S.S.R., divide parasites and vectors into two groups. To the first group belong animals which are to be found in all geographical-climatic zones. This group comprises enterobiasis, hymenolepidiasis, taeniasis and unilocular hydatid. Distribution of agents and vectors of the second group is limited by geographical-climatic zones.

N. Jones

529—FRANÇA, O. H. DA, 1958. "Distúrbios cutâneous provocados exclusivemente por parasitas intestinais, em adultos e crianças." **Pediatría Prática. São Paulo, 29** (1), 1–14. [English summary pp. 13–14.]

França discusses the relationship between skin lesions and intestinal parasites. After stressing that there appears to be no direct connection between the nature or intensity of the infection and the lesions, he suggests that all intestinal parasites should be eliminated if possible because of the chance that they may produce allergic reactions, even supposedly harmless forms. He points out that skin lesions should only be ascribed to parasitic infections when treatment and elimination of the parasites results in disappearance of the lesions. The use of parasite extracts for skin tests is not recommended.

C. A. Wright

530—MORISHITA, T. ET AL., 1959. [Department of Parasitology, Gifu Prefectural Medical School, Gifu, Japan.] [On the anthelmintic effect of dithiazanine.] Acta Scholae Medicinalis in Gifu, 7 (3), 785–789. [In Japanese: English summary p. 785.]

Enteric-coated pills of dithiazanine, administered orally, produced no undesirable side effects in man, with a daily dose of 600 mg. taken three times a day, 200 mg. at a time. This was continued for six days without any side effects. Whipworms could thus be destroyed and nearly 75% of the patients were found negative for the parasite eggs after treatment. The enteric-coated dithiazanine was well tolerated by the stomach and was easy to take. Hookworms, which are located in the upper part of the intestine, were less affected by dithiazanine because of the enteric coating. Faecal examinations revealed 36.8% of hookworm patients and 65% of ascaris patients to be negative after the six days of the treatment.

Y. Yamao

531—PAWŁOWSKI, Z., 1959. [Zakład Biologii, A. M., Poznań, Poland.] "Przegląd dorobku polskiej parazytologii lekarskiej za ostatnie dwulecie (1956–1958)." Wiadomości Parazytologiczne, 5 (2/3), 87–106. [Also in English pp. 107–116.]

This paper reviews the work on various aspects of medical parasitology undertaken in Poland during the last two years. It includes a bibliography of 126 titles.

G. I. Pozniak

532—ZHDANOV, V. M., 1959. [Control of parasitic diseases during 1956-1958 and basic trends towards their reduction and complete elimination.] Meditsinskaya Parazitologiya i Parazitarnie Bolezni. Moscow, 28 (3), 259-268. [In Russian.]

Zhdanov discusses, amongst other parasitic diseases, the control of helminthiasis in the U.S.S.R. He enumerates various problems in different parts of the country, concerning the control of helminthiasis and proposes some solutions.

N. Jones

VETERINARY HELMINTHOLOGY

Horses, Donkeys and Mules

See also Nos.: 664, 686, 689, 690, 803, 828, 831.

533—ABDUSSALAM, M. & SARWAR, M. M., 1957. "Schistosoma spindale in equines." [Abstract.]
Proceedings of the Pakistan Science Conference, 9th (1957), Part III, p. 126.

Abdussalam & Sarwar report the common occurrence of *Schistosoma spindale* in ponies in Lahore and claim a priority in recording it in equines, over Datta (1957). The claim of priority by the authors is based on a mention of it in the Annual Report of the College of Animal Husbandry, Lahore, for the year 1954–55.

M. M. Sarwar

534—ISHIHARA, T. et al., 1958. [Experiments on anthelmintic effects of piperazine compounds on horses.] Journal of the Japanese Veterinary Medical Association, 11 (2), 54-57. [In Japanese.] 100 mg. per kg. body-weight of piperazine adipate (P-A) or 75 mg. per kg. of piperazine carbon disulphide (P-CS₂) was effective against the adult as well as the immature form of the horse ascarid. There was no noticeable difference with different methods of administration, either mixed with food or through a catheter. Against Strongylus vulgaris, 150 mg. per kg. of P-A given by catheter was proved to be most effective. Against four species of Triodontophorus and other small strongyles 100 mg. per kg. to 250 mg. per kg. of P-A or 75 mg. per kg. of P-CS₂ was quite effective. Both compounds were less effective against Oxyuris equi and without effect against S. equinus and S. edentatus.

535—MIKLAUŠIĆ, B. & ŽUKOVIĆ, M., 1958. [Ambulantna služba i Zavod za parasitologiju i nametničke bolesti Veterinarskog fakulteta, Zagreb.] "Parasitske invazije u ekvida na Braču." Veterinarski Glasnik, 12 (2), 84–87. [English summary p. 87.]

Weterinarski Glasnik, 12 (2), 84–87. [English summary p. 87.]
Miklaušić & Žuković carried out coprological examinations of 950 mares, 150 gelding, 1,000 mules, 900 donkeys and 200 foals at a mule breeding centre in the Isle of Brač (Yugoslavia). Strongyle eggs were found in all and *Parascaris equorum* eggs in 11·5% of the animals examined. The incidence of parascariasis in 12-month-old equines was 38·5%, in one to three-year-olds 23·4%, in three to five-year-olds 15%, in five to ten-year-olds 7·6% and in those over ten years old 5·2%. Other helminths found were *Oxyuris equi* and *Parafilaria*. The authors claim that poor grazing and stabling conditions are probably mainly responsible for the high incidence of helminth infections.

536—VELICHKIN, P. A., 1958. [Experimental feeding of phenothiazine-salt blocks to horses against strongylid and trichonematid infections.] Byulleten Nauchno-Tekhnicheskoi Informatsii Vsesoyuznogo Instituta Gelmintologii im. Akademika K.I. Skryabina, No. 4, pp. 25–27. [In Russian.]

Velichkin has shown on seven horses that phenothiazine given in salt licking blocks (proportion 1 part phenothiazine to 8–10 parts salt) over a period of three to four summer months, effectively reduced the number of *Trichonema* larvae in the faeces whilst the passing of strongylid eggs ceased completely. There were no harmful side effects. The animals should consume not less than 2 gm. of phenothiazine daily and should receive an initial therapeutic dose. The advantage of this method is the convenience of its application.

G. I. Pozniak

Cattle

See also Nos. 447, 464, 473, 661, 662, 664, 666, 669, 671, 673, 675, 681, 684, 688, 689, 690, 815, 828, 859, 900, 902, 932, 951, 955, 965, 975, 976, 977.

537—ASADOV, S. M., 1958. [The helminth fauna of zebu cattle and buffaloes in Azerbaidzhan.] Dokladi Akademii Nauk Azerbaidzhanskoi SSR., 14 (12), 1031–1034. [In Russian.] Seventeen species of helminths were found in five zebu cattle and five buffaloes slaughtered at Baku. Of these, Cooperia punctata and Haemonchus contortus are new records for the zebu and C. oncophora, C. zurnabada, Chabertia ovina, Ostertagia lyrata and Paracooperia nodulosa for the buffalo. P. nodulosa is reported for the first time from the U.S.S.R. The number of helminths known for zebu cattle is herewith brought up to 26 and for buffaloes to 20.

G. I. Pozniak

538—BANKS, A. W. & KORTHALS, A., 1959. [Institute of Medical and Veterinary Science, Adelaide, South Australia.] "Risk of worm disease in cattle moved from dry country to lush pastures." Australian Veterinary Journal, 35 (10), 460–462.

In this article the authors have attempted to assess the risk of young animals, bred in the dry Alice Springs district of the Northern Territory of Australia (annual rainfall, 10 inches), acquiring serious infections of internal parasites when moved at 9 to 18 months of age to lush pastures 1,000 miles south in South Australia. All animals showed evidence of having acquired light infections of a wide range of parasites, mainly *Haemonchus placei* and *Cooperia pectinata* and *C. punctata*, in the Northern Territory. In fattening trials over a two-year period there was

no evidence of any parasitic disease and it seems evident that the light infections to which the animals had been exposed early in life were sufficient to make them resistant to the infections in their new environment.

F. H. S. Roberts

539—BELJIN, V., 1958. "Rijedak slučaj multipne ehinokokoze krave." Veterinarski Glasnik, 12 (5), 384.

Beljin reports on a case of multiple hepatic hydatid in a cow in the neighbourhood of Sarajevo. Numerous uniocular cysts were found within and on the surface of the liver. Some of the cysts showed scars indicative of rupture, yet secondary hydatid had not appeared. N. Jones

540—BESSONOV, A. S., 1958. [Seasonal and age dynamics of some nematode infections of cattle in the West Kazakhstan region.] Byulleten Nauchno-Tekhnicheskoi Informatsii Vsesoyuznogo Instituta Gelmintologii im. Akademika K.I. Skryabina, No. 4, pp. 12–19. [In Russian.] Bessonov has studied, by post-mortem examinations of cattle and faecal examinations of calves, the infection dynamics of Trichostrongylidae throughout the year 1957-58 in the Urals. Although the general course of infection with the various genera was similar, each exhibited some characteristic trends. With Ostertagia the infection rate was high throughout the year, the maximum occurring in the May to September period and the minimum (74.6%) infected) in January; in calves newly put out to pasture the infection first rose slowly during June-July then rapidly to a peak in October-November. With Haemonchus the infection rose rapidly in spring to a single peak of about 80% in June; in young calves the peak (44%) was reached in September; adult worms appeared to be completely absent from November to January. With Parabronema a single peak occurred in August. With Cooperia the infection rate of yearlings was high throughout the year with two peaks, one in June-July and the other in October-November; in younger calves infection rose rapidly in the autumn to a maximum in November. Trichostrongylus was similar to Cooperia. These trends are illustrated by graphs for adult cattle, yearlings and young calves. G. I. Pozniak

541—BOTTI, L., PIEROTTI, P. & EMDIN, R., 1957. [Istituto di Patologia Generale e Anatomia Patologica Veterinaria e Cattedra di Parassitologia della Università di Pisa.] "Localizzazione da linguatula in cuore bovino." Atti della Società Italiana delle Scienze Veterinarie, 11, 723–726. [English & French summaries p. 726.]

Botti et al. found a larval form of *Linguatula* in the heart of a bovine yearling at the Pisa abattoir. This erratic parasite was recovered from a nodule, the size of a large hazel nut, lying sub-endocardially in the damaged ventricle.

N. Jones

542—BREMNER, K. C. & KEITH, R. K., 1959. [Division of Animal Health and Production, C.S.I.R.O., Veterinary Parasitology Laboratory, Yeerongpilly, Queensland, Australia.] "The effect of copper deficiency on trichostrongylosis in dairy calves." **Australian Veterinary Journal**, **35** (0), 389–395.

The authors have carried out trials to determine the effect of copper deficiency, which is known to occur in cattle in south-east Queensland, on the susceptibility of calves to infection with gastro-intestinal helminths. Observations commenced at three to ten weeks of age and continued for 10 to 11 months. The copper supplement groups received 30 mg. of copper as sulphate intravenously every 14 days. Body-weights, haemoglobin values, blood and liver copper levels, and faecal egg counts were also taken every 14 days. In the unsupplemented groups blood and liver copper levels fell to very low levels reaching 0.027 to 0.070 mg. per 100 ml. for blood copper levels and 12 to 15 p.p.m. for liver copper levels. In the supplemented groups these levels remained within normal limits. Heavy infections mainly Haemonchus placei, Cooperia punctata, C. pectinata and Bunostomum phlebotomum, occurred in all groups and no significant differences in the degree of infection between the unsupplemented mented groups these levels remained with normal limits. Heavy infections, mainly Haemonchus placei, Cooperia punctata, Cooperia pectinata and Bunostomum phlebotomum, occurred in all groups and no significant differences in the degree of infection between the unsupplemented and supplemented calves were apparent. There were no differences also in haemoglobin values and weight gains. It is concluded that copper deficiency is not a major nutritional factor influencing the susceptibility of calves to parasitic gastro-enteritis in south-east F. H. S. Roberts Oueensland.

543—BULJEVIĆ, S. M. & RENDIĆ, D., 1958. "Jedan nalaz Linguatula serrata u jetri goveda." Veterinarski Glasnik, 12 (7), 544. Buljević & Rendić report that they found a Linguatula serrata larva in the liver of a bull in the N. Jones

district of Pančevo [Yugoslavia].

544—CORTICELLI, B. & LAI, M., 1957. [Istituto di Patologia Speciale e Clinica Medica Veterinaria della Università di Sassari.] "Sulla applicazione di una tecnica parassitologica nella diagnosi della strongilosi gastro-intestinale dei bovini." Atti della Società Italiana delle Scienze Veterinarie,

11, 945-950. [English & French summaries p. 950.]

Corticelli & Lai used Roberts & O'Sullivan's egg counting technique, as a modification of that of Gordon & Whitlock [for abstracts see Helm. Abs., 19, No. 8b, and 8, No. 35a] to establish the degree of infection with gastro-intestinal strongyles in seven cattle. The parasite species were determined by larval culture, using the Baermann apparatus for collecting larvae. The results, compared with those of post-mortem examinations, were highly satisfactory. [It is stated in the text that the technique of Roberts & O'Sullivan (1956) modified by Gordon & N. Jones Whitlock, was used.

545—DEMIDOV, N. V., 1958. [Further investigations with difluorotetrachlorethane against fascioliasis in cattle.] Byulleten Nauchno-Tekhnicheskoi Informatsii Vsesoyuznogo Instituta Gelmintologii im. Akademika K.I. Skryabina, No. 4, pp. 36–38. [In Russian.]

Freon-112 (difluorotetrachlorethane), with small additions of Freon-12 (difluorodichlormethane) to lower its melting point, was tested against fascioliasis in cattle. The most effective doses were 0.3 ml. and 0.4 ml. per kg. body-weight. These cured 80% and 100% of animals respectively in a first experiment where autopsy was performed four days after treatment, and 71.6% and 86% in a second experiment where autopsy was made after eight days. The maximum non-lethal dose was 3 ml. per kg. The drug can be administered by mouth from a rubber bottle or directly into the rumen by syringe. G. I. Pozniak

546—DHANAPALA, S. B. & FERNANDO, C. H., 1958. [Veterinary Research Laboratory, Peradeniya, Ceylon.] "A record of *Dinobdella ferox* (Blanchard), a leech found in the nasal cavities of a buffalo, with notes on leeches infesting domestic animals in Ceylon." Ceylon Veterinary Journal, 6

Dhanapala & Fernando record a case of the leech Dinobdella ferox infesting the nasal cavities of a buffalo. The authors briefly discuss various aspects of hirudiniasis including the other species of leeches which commonly attack domestic animals and man in Ceylon; instances of leeches acting as intermediate hosts for protozoan blood parasites of fish, tortoises, snakes and domestic birds; leech bite and methods of leech removal; and the effectiveness of various repellents used against leeches.

547—DIVLJANOVIĆ, D. K., 1958. "Osvrt na odnos stepana invazije sa *Thelazia rhodesii* u goveda prema patološko anatomskim promenama u oku." Veterinarski Glasnik, 12 (12), 1017–1018.

[French summary p. 1018.]

Divljanović reports that a total of 3,444 specimens of Thelazia rhodesii were recovered from 672 infected cattle, slaughtered in the abattoir of Valjevo. The parasites were mainly found under the palpebrae tertiae and under the eyelids. In most cases females were much more numerous than males. The presence of the parasites produced conjunctivitis, which varied in degree with the intensity of infection. N. Iones

548—EMDIN, R. & PIEROTTI, P., 1957. [Centro Veterinario di Idatidologia e Cattedra di Parassitologia della Università di Pisa.] "Indagini statistiche sulla echinococcosi dei bovini macellati in Pisa." Atti della Società Italiana delle Scienze Veterinarie, 11, 710–711. [English & French summaries p. 711.]

Emdin & Pierotti report that about 2.7% of 4,655 cattle, slaughtered at Pisa abattoir from June 1956 until July 1957, had hydatid cysts. The greatest incidence of infection was amongst cows (15·1% of 761). N. Jones 549—FERNANDO, S. T., 1959. [Department of Veterinary Science, Peradeniya, Ceylon.] "Studies on *Mecistocirrus digitatus* infestation in Ceylon (a nematode found in the abomasum of ruminants). Class—Nematoda: family—Trichostrongylidae (Leiper, 1912)." Ceylon Veterinary Journal, 7 (1/2), 19–23.

Fernando reviews some of the literature on *Mecistocirrus digitatus* Linstow, 1906 and gives an account of its distribution in Ceylon. He also describes the morphology of the eggs and third-stage larvae, giving detailed measurements and drawings. The investigation showed that it is the commonest abomasal parasite of cattle in Ceylon, with an island-wide distribution except in the Hill Zone at an elevation above 3,000 feet. The eggs contain 16 cells when passed in the faeces, are darkly pigmented, measure $112\,\mu$ to $122\,\mu$ by $51\,\mu$ to $55\,\mu$ in length and width respectively and are slightly oval with one of the sides flatter than the other. The third-stage larvae are $643\,\mu$ to $780\,\mu$ long and $19\cdot5\,\mu$ to $23\cdot3\,\mu$ wide. The pointed tail of the sheath is from $42\,\mu$ to $78\,\mu$ long, the rhabditiform oesophagus is $139\,\mu$ long, the tail of the larva bears a small, blunt process about $5\cdot7\,\mu$ long. The larva terminates anteriorly in a conical knob $2\cdot6\,\mu$ to $3\,\mu$ long; about $12\,\mu$ from its anterior end two dark cuticular structures resemble an inverted "U". There is no buccal cavity. Preliminary studies indicate that this parasite may be an important cause of gastro-enteritis in calves in Ceylon. W. M. Fitzsimmons

550—GINSBERG, A. & GRIEVE, I. M., 1959. [Department of Veterinary Services, Kabete, Kenya.] "Two unusual cases of liver cysticercosis." **Veterinary Record**, **71** (30), 618.

Ginsberg & Grieve report that the incidence of *Cysticercus bovis* infection in the livers of cattle in Kenya reached $1\cdot 2^{\circ}/_{\circ}$. Mostly only one cyst per liver could be found in cases of generalized cysticerciasis. However, 1,836 *C. bovis* cysts were found in the liver parenchyma of one steer and cysts were also numerous under the liver capsule of another steer. A thorough examination of skeletal muscles and organs in both these cases did not reveal any cysts.

N. Jones

551—GRÉGOIRE, C., POUPLARD, L., COTTELEER, C., SCHYNS, P. & THOMAS, J., 1958. [École de Médecine Vétérinaire de l'État, Cureghem-Bruxelles.] "La lutte contre la bronchite vermineuse des bovidés." Annales de Médecine Vétérinaire, 102 (7), 435–457.

Grégoire et al. report on the control of Dictyocaulus viviparus in cattle. As a result of rotational grazing two groups of cattle had moderate symptoms of dictyocauliasis, whereas a control group which remained throughout on the same pasture was severely affected. In another experiment seven calves were experimentally infected with D. viviparus; clinical symptoms of the infection appeared in the fourth week and larvae in the faeces on the 30th day after infection; the number of larvae excreted increased at first and then diminished and had fallen to zero in most cases by the 50th day. Successive experimental reinfections did not modify the state of infection in most of these animals. Autopsy of the animals at the post-reproductive phase of the parasite revealed no parasites in the respiratory apparatus but pulmonary lesions, which had the aspect of conjuctive metaplasia, were present. Some 167 cattle, including three of the seven experimental calves, received two or three injections of Dictycide (cyanacethydrazide). In 93 cases no apparent effect was noticed. In the other 74 cases good results were obtained, especially when the treatment was applied at the reproductive phase of D. viviparus or in conjunction with rotational grazing.

Froceedings of the Pakistan Science Conference, 9th (1957), Part III, pp. 131–133. Huq and his associates report failures in their attempts to set up hump sore in cattle by (i) transmitting flies to artificial wounds after they had fed on hump sores, (ii) smearing of material from hump sores on artificial wounds and (iii) emulsifying the hump sore-fed flies and rubbing them on the artificial wounds. However, the infection was successfully established when living adults were transplanted on to artificial wounds.

M. M. Sarwar

553—JARRETT, W. F. H., JENNINGS, F. W., McINTYRE, W. I. M., MULLIGAN, W., SHARP, N. C. C. & URQUHART, G. M., 1959. [University of Glasgow Veterinary School, Glasgow, Scotland.] "Immunological studies on *Dictyocaulus viviparus* infection in calves—double vaccination with irradiated larvae." American Journal of Veterinary Research, 20 (76), 522-526.

Five groups of ten calves were vaccinated with 1,000 irradiated larvae of *Dictyocaulus viviparus* and this was followed in three of the groups by a second vaccination of either 1,000, 2,000

or 4,000 irradiated larvae. Together with unvaccinated controls these animals were challenged with 10,000 viable larvae. An assessment of the immunity produced was estimated by examining the respiratory rate and the weight gain of the calves. The results show that the calves which had received the double vaccination had no increased respiratory rate, no larvae in the faeces or adult worms in the lungs at necropsy and also had higher weight gains than the other groups. The group which had had only one vaccination showed a slight increase in respiratory rate, some larvae in the faeces and adults in the lungs at necropsy; but these features were less marked than in the control untreated animals.

K. Heath

554—JERKIĆ, Z., 1958. [Veterinarska stanica Brod. Stupnik.] "Suzbijanje fascioloze u Dubočcu." Veterinarski Glasnik, 12 (12), 1022–1025.

Jerkić reports on the results of experimental control of fascioliasis among 380 cattle grazed on an infected pasture. Three treatments by Wetzel's method were carried out, one in the winter, one in the spring and one in the summer of 1956. The pastures did not appear to carry a heavy infection following a very hard winter and these treatments were repeated on a small proportion of the animals in January and April of the following year. Against Galba, which were numerous, copper sulphate was used. As well as this prophylactic measure, the pasture received 500 kg. of artificial fertilizers per hectare for three consecutive years. As a result the milk yield increased considerably and the incidence of fascioliasis was greatly lowered, although it fluctuated owing to reinfections.

555—MASIMA, R., SAKO, S. & EGUCHI, H., 1958. [Therapeutic effects of piperazine derivatives and other chemicals on Wahi disease, or enzootic parasitic dermatitis in oxen in Japan.] Journal of the Japanese Veterinary Medical Association, 11 (2), 87-88. [In Japanese.] Sato et al. (1953) had already found microfilariae of Onchocerca gutturosa Neumann in the skin of oxen with Wahi disease. Masima et al. tried Spatonin, a derivative of piperazine, with Benacal B₆ (containing antihistamine, vitamin B₆ and calcium) in the treatment of Wahi disease of oxen. This proved satisfactory, apparent cure being obtained.

Y. Yamao

556—MICHEL, J. F. & CORNWELL, R. L., 1959. [Ministry of Agriculture, Fisheries & Food, Central Veterinary Laboratory, Weybridge, U.K.] "The complement fixation test as a measure of resistance to *Dictyocaulus* infection." **Veterinary Record, 71** (43), 912–913.

A comparison has been made between the acquired resistance to *Dictyocaulus* infection and the levels of complement fixing antibody in calves. Ten pairs of calves were used. One of each pair received approximately 3,500 third-stage larvae of *Dictyocaulus viviparus* orally and all calves were given a further 35,000–40,000 larvae 11 to 135 days later. Ten days after this larger dose of larvae the calves were killed and counts made of the worms found in the lungs. It was possible to distinguish between primary and secondary infections on the basis of size of the worms. Weekly bleedings were made from the day that the first calf received the initial dose of larvae. The complement fixation tests were carried out using heated whole worm antigen. It was shown that a useful degree of protection develops some weeks before a rise in titre is apparent and that at a later stage in the infection, where a high titre and strong protection occurs there is no direct connection between the two responses. The lack of correlation between titre and protection occurring at different stages of infection suggests that in the case of *Dictyocaulus viviparus* complement fixing antibodies as measured by heated adult worm antigen are not protective and cannot be used as a reliable measure of protection.

K. Heath

557—MIKAČIĆ, D., 1959. [Zavod za parasitologiju i nametničke bolesti Veterinarskog fakulteta Sveučilišta, Zagreb.] "Odnos između koprološkog nalaza i stupnja invazije velikim metiljem (Fasciola hepatica) u goveda." Veterinarski Arhiv, 29 (9/10), 244–249. [English & French summaries pp. 248–249.]

Mikacić studied the relationship between the number of Fasciola hepatica eggs in the faeces and the number of adult worms in the liver. Altogether 100 cattle of different ages and breed

and with different degrees of infection were examined. The average "index"

number of adult living flukes was 13.85. This index was higher in older animals, mean number of eggs in 10 gm. faeces and also in those with severe and chronic lesions, than in younger animals and those with smaller lesions. It also varied with the different breeds of cattle.

558—NENADIĆ, M. B., 1957. [Sreska veterinarska stanica, Pljevlja.] "Cysticerkoza govedi zaklanih na pljevaljskoj klaonici." Veterinarski Glasnik, 11 (12), 1194-1197. Nenadić reports that 22·36% of 1,167 head of cattle slaughtered at the abattoir of Pljevlja (Yugoslavia), between February and August, 1957, had Cysticercus bovis infection. N. Jones

559—NENADIĆ, M. B., 1958. [Veterinarska stanica, Pljevlja.] "Cysticerkoza govedi zaklanih na pljevaljskoj klaonici. (II saopštenje)." Veterinarski Glasnik, 12 (12), 1019–1021. Nenadić reports that 14.50% of 696 cattle, slaughtered in the abattoir of Pljevlja (Yugoslavia) in the second half of 1957, had cysticerciasis. For the first half of the following year the

incidence was 24.64% of 1,135 cattle.

560—PALMAS, G., 1957. [Istituto di Patologia Generale ed Anatomia Patologica Veterinaria della Università di Sassari e Centro di Studio per la Parassitologia Veterinaria del C.N.R.] "Trichostrongylus" longispicularis repertato in bovini della Sardegna." Atti della Società Italiana delle Scienze Veterinarie, 11, 591-594. [English & French summaries p. 594.]

Palmas reports finding Trichostrongylus longispicularis in about 20 Sardinian cattle. Differential characteristics of this species are given supplemented with a photograph of a male specimen.

N. Iones

561—PARKER, W. H., ROBERTS, H. E., VALLELY, T. F. & BROWN, F. T., 1959. [Veterinary Investigation Centre, Wolverhampton.] "Field trials of diethylcarbamazine against lungworms in cattle." Veterinary Record, 71 (25), 509–511, 513.

Three field trials of diethylcarbamazine against husk are reported. The weight gains, faecal larval output and clinical appearance of both control and treated animals are examined. The diethylcarbamazine was administered as a 10% or 12% solution by intramuscular injection at doses of 10 mg. per lb. body-weight as three daily injections. The results of two trials showed an increase in the weight gains of the treated groups and also, in one experimental group, a reduction of larval output when compared with the control animals. The results of the third trial were complicated by the appearance of "virus pneumonia" but a significant reduction of the larval output occurred on the 15th day. K. Heath

562—PELLEGRINI, N. & BONO, G. DEL, 1957. [Istituto de Patologia Generale e Anatomia Patologica Veterinaria della Università di Pisa.] "Rilievi e considerazioni sulla infestione da Cysticercus bovis in provincia di Pisa." Atti della Società Italiana delle Scienze Veterinarie, 11, 726-730. [English & French summaries p. 730. Discussion p. 730.]

Pellegrini & Bono report on the incidence of Cysticercus bovis infection in the province of Pisa. 7,589 calves, 11,932 yearlings, 756 heifers, 43 oxen, 203 bulls and 2,654 cows were slaughtered at Pisa abattoir from January 1955 until June 1957 inclusive. The incidence of cysticerciasis was 0.49% among the yearlings and only one calf was infected. The authors conclude that animals bought outside the province are largely responsible for the incidence of cysticerciasis. N. Jones

563—ROBERTS, F. H. S. & KEITH, R. K., 1959. [Division of Animal Health & Production, C.S.I.R.O., Veterinary Parasitology Laboratory, Yeerongpilly, Queensland, Australia.] "Observations on the effect of treatment with phenothiazine on the development of resistance by calves to infestation with the stomach worm, *Haemonchus placei* (Place 1893) Ransom 1911." Australian Veterinary Journal, 35 (9), 409–414.

Resistance to Haemonchus placei was readily demonstrated in calves reared worm-free and given spaced doses (50,000 larvae at week 1, at week 8 and at week 17) and daily doses (1,000 each day for 13 weeks and 50,000 during week 15) of larvae. In these calves the egg count showed only a single peak at the sixth to tenth week and thereafter fell to very low levels which were maintained despite reinfection. At autopsy after 24 weeks only small numbers of worms were present, mainly fourth-stage. When other animals subjected to similar infections

were treated with phenothiazine (0.2 gm. per lb. body-weight) the egg counts showed several peaks. At autopsy the calves given spaced doses had only very few adult worms but larger numbers of fourth-stage, whereas those on daily doses were found heavily infected with both fourth and fifth stages. It seemed evident from these results that treatment had delayed the acquisition of resistance, and was responsible for the heavy infections in the calves given daily doses of larvae. In view of the findings that mature worms are highly susceptible to phenothiazine and the early fourth and fifth stages highly resistant (Roberts, F. H. S. & Keith, R. K., 1959, Aust. vet. J., 35, 38) the authors consider that resistance may be in some way associated with the mature worms, the removal of which by treatment permitted development of the immature stages.

564—ROSE, J. H., 1959. [Ministry of Agriculture, Fisheries & Food, Central Veterinary Laboratory, Weybridge, Surrey, U.K.] "The nematodes Ostertagia lyrata Sjöberg, 1926, and Trichostrongylus longispicularis Gordon, 1933, in British cattle." [Correspondence.] Nature. London, 183 (4677), 1745–1746.

Rose adds Trichostrongylus longispicularis and Ostertagia lyrata to the list of gastro-intestinal nematodes recorded from cattle in Britain. Both were present in material collected during routine post-mortem examinations of cattle from south-eastern England. O. lyrata was found in the abomasum and T. longispicularis in the small intestine. The characters which distinguish these two from related species are given and their known distribution recorded. There is no experimental evidence relating to the pathogenicity of either.

S. Willmott

565—ROSS, J. G., ARMOUR, J., HART, J. & LEE, R. P., 1959. [Federal Department of Veterinary Research. Veterinary Research Laboratories, Vom, Nigeria.] "Haemonchus spp. X-irradiated larval vaccine in Nigerian Zebu cattle." [Correspondence.] Veterinary Record, 71 (35), 751.

Ross et al. dosed 12 parasite-free calves twice at monthly intervals with 10,000 Haemonchus spp. larvae irradiated with a 60,000 roentgens dose. One more similar calf was given 10,000 untreated larvae at the same time as the first dose and another the same at the time of the second dose. Twelve more calves acted as controls. Six weeks later, five vaccinated calves and six controls were challenged artificially with 10,000 Haemonchus spp. larvae. On slaughter seven weeks later, the vaccinated animals showed a 60% reduction in all stages of Haemonchus spp. burden compared with the control animals. The remaining five vaccinated calves and six controls were placed on heavily infected pasture for comparison with the artificially challenged animals. Results will be reported later. Ross et al. consider that an effective vaccine against Haemonchus spp. can be developed.

566—SWANSON, L. E., WADE, A. E., SENSEMAN, V. F. & DJAFAR, M. I., 1959. [Department of Veterinary Science, University of Florida, Gainesville, Florida, U.S.A.] "The efficacy of cyanacethydrazide as a treatment of lungworm, *Dictyocaulus viviparus* (Bloch), infections in cattle." American Journal of Veterinary Research, 20 (78), 777–783.

A description is given of a trial carried out to test the efficacy of cyanacethydrazide at doses of

A description is given of a trial carried out to test the efficacy of cyanacethydrazide at doses of 250 mg. per 35 lb. of body-weight in the treatment of *Dictyocaulus viviparus* in cattle. It was shown that there was no significant difference in the output of larvae or pathology of the lungs between control and treated animals. The number of adult worms found in the lungs at necropsy did show some reduction in the treated cattle. Weight gains in the animals which survived the 87-day experiment showed that the control calves gained an average of 27 lb. per head more than the treated animals.

K. Heath

567—ŚWIETLIKOWSKI, M., 1959. [Zakład Parazytologii, Polska Akademia Nauk, Warszawa, Pasteura 3, Poland.] "Badania nad epizootiologią robaczycy płucnej bydła." Acta Parasitologica Polonica, 7 (13/22), 249–305. [English summary pp. 300–305.]

The Zuławy lowland, reclaimed for cattle breeding after the war, has been affected by *Dictyo-caulus viviparus*. A four-year study of the disease has been directed (i) to the examination of herds (faecal tests by a modified Baermann's method), pastures, troughs and cow-sheds, and (ii) to detailed observations in the field and laboratory of the biology of larvae. The results, which often agreed with known data, also showed the following: young calves put on pasture first became infected in June-July with a peak in late autumn, calves in their second

year showed only one peak, in May, while in older cattle infections progressively decreased. In infected animals larvae were also found in the nasal slime. Larvae on pasture were able to survive the winter. Infective larvae were twice as resistant to drying as non-infective ones. Larvae could migrate horizontally for up to 4 cm. but no vertical migration was observed. During moulting, the author observed a shrinkage of the larvae at the head and tail ends. The sheath from the first moult was shed only occasionally, mostly by older larvae. In one larva three sheaths were seen; they were particularly distinct at the head end.

G. I. Pozniak

568—URQUHART, G. M., 1958. [East African Veterinary Research Organisation, Muguga, Kenya.] "The production of experimental cysticercosis in calves in Kenya." Bulletin of Epizootic Diseases of Africa, 6 (4), 385–393. [French summary pp. 392–393.]

46 calves aged 1–98 days were each dosed with thousands of *Taenia saginata* eggs. At autopsy 14–28 days later about half of the calves were shown to be heavily infected with hundreds to thousands of cysts. The remainder of the calves were resistant to the infection in that only 0–100 cysts were recovered from each carcass. Resistance to experimental infection is due sometimes to innate resistance but more often to infection acquired prior to the experimental infection. The absence of colostrum in the diet of 14 calves did not produce increased susceptibility to experimental infection. *T. saginata* eggs obtained from a tapeworm expelled by mepacrine were shown to be infective for calves.

G. M. Urquhart

569—VUJIĆ, B. & BIRTAŠEVIĆ, J., 1958. [Veterinarski naučno istraživački i djagnostički institut NRS i Institut za zdravstveno prosvećivanje NRS.] "Primena metoda poučavanja stočara u jednom slučaju epizootije distomatoze." Veterinarski Glasnik, 12 (8), 635–638.

Vujić & Birtšević describe the education of cattle breeders in relation to epizootic fascioliasis.

N. Jones

570—WEBER, T. B. & LUCKER, J. T., 1959. [Animal Disease and Parasite Research Division, Agricultural Research Service, U.S. Department of Agriculture, Beltsville, Maryland, U.S.A.] "Immunity against the cattle lungworm: resistance resulting from initial infection with small numbers of larvae."

Proceedings of the Helminthological Society of Washington, 26 (2), 132–137. This paper gives the results of an experiment carried out in six calves (three ten days old and three aged five-and-a-half months). Four calves were given an initial infection with 500 Dictyocaulus larvae and two with 1,500 larvae. About two-and-a-half to three months after the initial exposure, when signs of infection had ceased, each calf was challenged with 25,000 larvae. Control animals of similar age groups were also challenged with 25,000 larvae. Five out of six previously infected calves were shown to have acquired strong resistance, outgaining the controls in weight, showing mild if any respiratory distress and having a much reduced faecal larval output. The immunizing infections did not materially affect the growth of the calves but caused slight to moderate respiratory distress.

K. Heath

Sheep and Goats

See also Nos. 431, 464, 473, 483, 661, 664, 666, 669, 671, 672, 673, 677, 681, 684, 688, 689, 690, 795, 801, 809, 824, 825, 879, 889, 921, 924, 931, 932, 933, 944, 945, 965, 970, 974, 977.

"Mixed grazing and Nematodirus disease of lambs." Veterinary Record, 71 (39), 820–823.

Baxter placed two ewes and four lambs on each of four paddocks having areas of one-third of an acre. The animals grazed here from March until June of 1957 and developed symptoms of nematodiriasis. In 1958 the paddocks were stocked with Nematodirus-free ewes and their lambs. Two paddocks carried two ewes and four lambs each as before, but the other two had only one ewe and two lambs each. Two calves were grazed on these latter two paddocks, spending a period on one paddock and then being transferred to the other. Herbage examinations and worm egg counts were made throughout the tests. The calves became infected with N. filicollis and N. battus. The lambs in the paddocks without the calves showed mild to severe symptoms of infection; of the lambs grazing with calves, two showed no symptoms

while of the other two, one died and the other was severely affected. The paddock in which the lamb died was grazed more heavily by calves than the one in which the lambs showed no symptoms. Baxter concludes that mixed grazing will not control nematodiriasis and that where mixed stocking results in heavy grazing the danger may be increased. He supports this conclusion with estimations of numbers of infective larvae to be found at different levels of herbage, showing that the highest concentrations of larvae are found on the base of grass blades.

H. D. Crofton

572—BOTTI, L. & PIEROTTI, P., 1957. [Istituto di Patologia Generale e Anatomia Patologica Veterinaria e Centro di Idatidologia.] "Rottura della ciste da echinococco nei dotti biliari dell'ovino. II. Quadri colangiopatici e colangectasici." Annali della Facoltà di Medicina Veterinaria. Pisa, 10, 48–57. [English & French summaries p. 56.]

Botti & Pierotti describe in detail the rupture of hydatid cysts into the bile-ducts of sheep on the basis of numerous cases observed in sheep in the Pisa abattoir. The paper is illustrated with numerous photographs.

N. Jones

573—CERETTO, F., 1957. [Istituto di Patologia Generale ed Anatomia Patologica Veterinaria della Università di Torino.] "Sulla c.d. adenomatosi polmonare degli ovini e suoi rapporti con la strongilosi." Atti della Società Italiana delle Scienze Veterinarie, 11, 763–766. [French & German summaries pp. 765–766.]

Ceretto examined various pulmonary lesions in sheep, due to strongylosis. Adenoma-like lesions, consisting of metaplastic changes, localized in the alveolar and bronchial epithelia represented a pathological phenomenon secondary to that of interstitial chronic pneumonitis. Fibro-adenoma occurred only in those regions of the lung where there had been interstitial inflammatory processes. Out of about 100 cases examined in only three was papillary adenoma observed, this being localized in the branches of bronchioles.

N. Jones

574—CHUBABRIYA, I. T. & GODERDZISHVILI, G. I., 1959. [The use of tin arsenate against Moniezia and Thysaniezia in sheep.] Veterinariya, 36 (10), 34–35. [In Russian.] Chubabriya & Goderdzishvili recommend the use of tin arsenate for control of Moniezia infection in sheep. The dose for lambs one to four months old is 0.4 gm., four to six months, 0.6 gm. and six to eight months, 0.8 gm. It is necessary to keep them away from food for 16–18 hours before treatment. For prophylactic purposes the first dose should be given five to ten days before the normal seasonal appearance of tapeworms and twice more at intervals of 25–30 days. The authors recommend tin arsenate in a dose of 1 gm. tablet twice a year (in spring and autumn) against Thysaniezia and Avitellina. Food should be withheld for at least 18 hours before dosing, since any shorter time of fasting reduces the efficacy of the drug. The lambs treated with tin arsenate weighed on the average 9.8 kg. more and gave 350 gm. more wool in comparison with those which were not dosed.

C. Rayski

575—DORNEY, R. S. & TODD, A. C., 1959. [Madison, Wisconsin, U.S.A.] "Ronnel (Trolene) as an anthelmintic in lambs." Journal of the American Veterinary Medical Association, 135 (6), 336-338.

Trolene (Dow ET-57) was given as a single dose of 200, 400 or 600 mg. per kg. body-weight (active ingredients) to 22 lambs in two trials, six untreated lambs acting as controls. The drug at all three dose levels was shown by egg counts, taken before and one to five weeks after the treatment, to be effective against *Haemonchus*, *Ostertagia*, *Strongyloides* and *Nematodirus*. Anorexia, diarrhoea and muscular weakness accompanied the higher dosage levels and death occurred in one of nine lambs which had received 600 mg. The authors conclude that the 200 mg. dose probably represents the upper tolerance level in lambs.

G. I. Pozniak

576—DREŽANČIĆ, I., 1958. "Parasitski gastroenteritis u ovaca." Veterinarski Glasnik, 12 (12), 1009–1013.

Drežančić gives a general review of some of the known facts relating to gastro-intestinal helminthiasis in sheep.

N. Jones

577—DREŽANČIĆ, I., 1958. "Suvremeno suzbijanje parasitskog gastroenteritisa ovaca." Veterinarski Glasnik, 12 (12), 1014-1016.

Drežančić discusses the use of some well known anthelmintics against gastro-intestinal helminths in sheep and stresses the importance of their prophylactic use. N. Iones

578—ENIGK, K. & FEDERMANN, M., 1958. [Institut für Parasitologie und vet. med. Zoologie der Tierärztlichen Hochschule, Hannover.] "Die Therapie beim Lungenwurmbefall des Schafes." Monatshefte für Veterinär Medizin, 13 (23), 705–709.

This paper is a review of the use of anthelmintics for eradication of the lungworm parasites of sheep, namely Dictyocaulus filaria, Protostrongylus rufescens and Muellerius capillaris. The direct methods of intratracheal injection, aerosols and inhalation, and the indirect methods of injection by intravenous, subcutaneous, intramuscular and oral routes have been examined. The anthelmintics investigated ranged from volatile liquids such as formaldehyde, chloroform and ether to antimosan, stibophen, emetine hydrochloride, piperazines, iodine compounds and cyanacethydrazide. The treatment recommended for eradication of the lungworms was a combination of injection of cyanacethydrazide for action against Dictyocaulus and emetine hydrochloride for Protostrongylus. It is, however, emphasized that this method is not ideal because of the incompatibility of emetine and the high cost of both preparations.

579—GADZHIEV, Y. G., 1958. [Allergic diagnosis of dictyocauliasis in sheep.] Byulleten Nauchno-Tekhnicheskoi Informatsii Vsesoyuznogo Instituta Gelmintologii im. Akademika K.I. Skryabina, No. 4, pp. 28–29. [In Russian.]

An early diagnosis of dictyocauliasis was attempted in 55 lambs (born of infected sheep) by intradermal tests with antigen prepared from mature worms. In July 67.2% of the lambs gave a positive and 20% a doubtful reaction, in August the corresponding figures were 77.7% and 20.3% and in September 86.2% and 9.8%. Simultaneous faecal tests revealed *Dictyocaulus filaria* larvae in none, in 9.2% and in 74.5% of lambs respectively. Thus, the infection was detected allergically one to one-and-a-half months earlier than by faecal examination. Protostrongylus larvae were also present. The tests do not attempt to confirm the specificity of the antigen.

580—GNEDINA, M. P., KOTELNIKOV, G. A., KRYUKOVA, K. A., OZERSKAYA, V. N. & SAZANOV, A. M., 1958. [Comparative efficacy of anthelmintics against fascioliasis in sheep.] Byulleten Nauchno-Tekhnicheskoi Informatsii Vsesoyuznogo Instituta Gelmintologii im. Akademika K.I. Skryabina, No. 4, pp. 30-35. [In Russian.]

Three anthelmintics were tested for their efficacy against fascioliasis in 50 naturally infected sheep. Filixan, given orally in doses of 0.4 gm. per kg., and carbon tetrachloride, given intraruminally in doses of 0.2 ml. per animal, were 100% effective. Subcutaneous injection of 3 ml. carbon tetrachloride per animal reduced infection intensities by 86.7% and cured five out of the ten sheep. Freon-112 (difluorotetrachlorethane) given intraruminally in doses of 0.2 gm. per kg. reduced intensities by 66.7% but cured only one out of ten sheep. G. I. Pozniak

581—HRECZKO, I., 1959. [Institute of Medical and Veterinary Science, Adelaide, South Australia.] "Infectious necrotic hepatitis in sheep in South Australia, possibly associated with Cysticercus tenuicollis." Australian Veterinary Journal, 35 (10), 462–463.

Hreczko describes the lesions in a case of necrotic hepatitis from which Clostridium oedematiens was isolated. No liver-flukes were found but the liver showed many subcapsular tracts of Cysticercus tenuicollis. He considers that it was a typical case of infectious necrotic hepatitis G. Frovd activated by lesions due to C. tenuicollis.

582-JANJIĆ, R., 1958. "Jedan slučaj akutne metiljavosti kod ovaca." Veterinarski Glasnik, 12 (11), 936-937.

Janjić reports on a case where 25% of 280 sheep died from acute fascioliasis from November to January of the following year. The author explains this case by the optimal climatic conditions for the development of the fluke, which occurred during the preceding months of N. Iones August, September and October.

583—MEKULI, E. S. & MARINČEVIĆ, S. U., 1958. "Naša zapažanja kod masovne, supkutane primene carboneum tetrachloratum-a protiv metiljavosti ovaca." Veterinarski Glasnik, 12 (4),

Mekuli & Marinčević used carbon tetrachloride at single doses of 4 ml. and 6 ml. respectively, injected subcutaneously into two lots of three sheep, and a single dose of one capsule of Distovin given to a third group of three sheep. The first groups of animals had Fasciola hepatica infection. The animals of the second and third groups had mixed infections with F. hepatica and Dicrocoelium dendriticum, except one animal which had only F. hepatica. Carbon tetrachloride injections were found to be quite efficient against F. hepatica. The drug administered by either method had no apparent effect on Dicrocoelium dendriticum. In another case a total of 2,015 sheep were treated [presumably against fascioliasis] with carbon tetrachloride injections. As coprological examinations of 530 of those animals showed, the incidence of infection was reduced by the treatment from $62 \cdot 3\%$ to $6 \cdot 1\%$. Some other examples of the use of carbon tetrachloride are given.

584—MERDIVENCI, A., 1959. "Ehli koyun (Ovis aries) larımızda bulduğumuz Paramphistomum cervi (Zeder, 1790/Schrank, 1790) (fam. Paramphistomatidae)." Türk Veteriner Hekimleri Dernegi Dergisi, 29 (148/149), 12-24. [English summary p. 20.]

Merdivenci records Paramphistomum cervi from domestic sheep for the first time in Turkey. The relevant literature is reviewed and the biology, pathology, symptoms and treatment of infection with this fluke are discussed.

J. M. Watson

585—MIKAČIĆ, D., 1958. "Poteškoće oko izrade plana protiv fascioloze. (Predlog za diskusiju)." Veterinarski Glasnik, 12 (11), 924–928.

Mikačić discusses the value of different plans in the control of fascioliasis in the light of local conditions, and suggests some alternative schemes depending on such conditions. N. Jones

586—MOULD, D. L. & SILVERMAN, P. H., 1959. [Animal Diseases Research Association, Moredun Institute, Gilmerton, Edinburgh, 9.] "Electrophoretic patterns of the serum proteins of sheep infected with Haemonchus contortus." [Correspondence.] Nature. London, 183 (4677), 1735.
 Mould & Silverman found that the sera of sheep which had become refractory to infection with Haemonchus contortus as the result of successive subcutaneous injections of larvae followed by a challenge dose frequently showed a pronounced increase in β-globulin. W. P. Rogers

587-NEVENIĆ, V., ŠIBALIĆ, S. & CVETKOVIĆ, L., 1958. [Institut za invazione bolesti Veterinarskog fakulteta, Beograd.] "Ekonomska opravdanost upotrebe fenotiazina pri suzbijanju želudačno-crevne strongiloze ovaca." Veterinarski Glasnik, 12 (11), 851–860. [English summary p. 860.] Nevenić et al. treated a total of 1,416 ewes, yearling sheep and lambs mainly against gastrointestinal strongyloses. The results were compared with 367 untreated controls. Dictyocaulus filaria, Dicrocoelium dendriticum and Trichuris ovis were also found in small numbers and Moniezia expansa occurred in all lambs examined. The treatment consisted of four doses of 15 gm. of phenothiazine (Phenovis) for lambs and 20 gm. for adult sheep, given as a drench over a period of one year. In addition, certain lambs received two treatments with copper sulphate separated by an interval of one month. The results, as compared with the control group, were as follows: (i) wool produced by treated ewes, yearlings and lambs was higher by 20 gm. to 520 gm. per animal; this includes all lambs and yearlings as well as Merino ewes and cross-breds, but not the Sjenica variety of Pramenka in which no increase was noted; (ii) the increase in milk yield was 6.3-20.1 litres per animal per season and was higher in home-bred ewes than in cross-breds; (iii) the weight gain in treated lambs was higher than that in the controls by 0.8 kg. and 3.2 kg. in females and males respectively; (iv) lambs that received two copper sulphate treatments as well as phenothiazine produced more wool (males by 0.45 kg. and females by 0.1 kg.) than did those treated only with phenothiazine. Their weight gain was also higher by 0.2 kg. to 4.1 kg. N. Jones

588—NOSIKOV, V. P., 1958. [On the epizootiology of trichostrongylid infections of sheep in the Leningrad region.] Sbornik Rabot. Leningradski Veterinarni Institut, 21, 239-244. [In Russian.] In the Leningrad region, Trichostrongylus and Ostertagia infections were present in sheep throughout the year usually in a subclinical form. Infection intensities rose in April to May and again, to a slightly lesser degree, in August to September. The species identified from 21 sheep and lambs were: T. axei, T. colubriformis, T. vitrinus, O. circumcincta, O. trifurcata and O. ostertagi; occasionally Haemonchus contortus, Nematodirus spathiger and Cooperia sp. were present.

G. I. Pozniak

589—OZERSKAYA, V. N. & POPOVA, K. A., 1958. [A comparison of the efficacy of ditrazine phosphate when administered in different dose regimens and a test of piperazine sulphate against dictyocauliasis in sheep.] Byulleten Nauchno-Tekhnicheskoi Informatsii Vsesoyuznogo Instituta Gelmintologii im. Akademika K.I. Skryabina, No. 4, pp. 51–53. [In Russian.]

Ditrazine phosphate dissolved in distilled water (1:3) and administered subcutaneously in doses of 0·1 gm. per kg. cured dictyocauliasis in nine out of ten sheep on single application and eight out of ten on two-fold application with a 24-hour interval. Ditrazine phosphate dissolved in 1% pyradon (amidopyrine) cured three out of seven sheep. Piperazine sulphate dissolved in distilled water (1:3) and given subcutaneously in doses of 8–15 ml. cured only seven out of ten sheep. Five untreated sheep served as controls. The intensities of infection in the treated groups were reduced by 95·9%, 96·7%, 77·5% and 52·5% respectively. G. I. Pozniak

590—PANASYUK, D. I., 1958. [Differential diagnosis of the early stages of dictyocauliasis from other lungworm infections of sheep.] Byulleten Nauchno-Tekhnicheskoi Informatsii Vsesoyuznogo Instituta Gelmintologii im. Akademika K.I. Skryabina, No. 4, pp. 54-60. [In Russian.] About 2,000 sheep on three farms were kept under observation for lung complaints throughout one year and intradermal and faecal tests for dictyocauliasis were made every two months. 60-70% of complaints were due to Dictyocaulus. The remainder reacted negatively to the tests and were shown to suffer from pneumonia, bronchopneumonia and occasionally gangrene of the lungs. Panasyuk tabulates the results obtained and from them concludes that only the allergic test can successfully detect dictyocauliasis and differentiate it from other lung diseases.
 G. I. Pozniak

591—PANASYUK, D. I., 1958. [Experimental treatment of the early stages of dictyocauliasis in sheep.] Byulleten Nauchno-Tekhnicheskoi Informatsii Vsesoyuznogo Instituta Gelmintologii im. Akademika K.I. Skryabina, No. 4, pp. 61–67. [In Russian.]

Various anthelmintics were tested for their efficacy against the larval and pre-adult stages of Dictyocaulus in sheep. Ditrazine phosphate in doses of 0·1 gm. per kg. in 15% aqueous solution injected subcutaneously or intramuscularly three times with an interval of two to five days, gave the best results curing 75% and reducing intensities by 99%. Aqueous iodine (1 gm. iodine crystals: 1.5 gm. potassium iodide: 750 ml. water) in doses of 10-15 ml. for lambs (15-20 ml. for sheep) given in the same way cured all the 25 lambs treated. The disadvantage of iodine, however, is that when injected subcutaneously or intramuscularly it only acts on worms migrating to the bronchi and when injected into the trachea only on those in the lungs. As it was observed that both these stages of infection occur simultaneously, a treatment must include, particularly during the autumn and winter, both types of dosing. The tests should be repeated on a larger number of sheep in the field. Piperazine adipate and phosphate in two doses of 0.5 gm. given orally or subcutaneously, injections of 0.01 gm. per kg. body-weight of piraldine in water suspension and piperazine orally, had little effect. Piraldine given 10 to 15 days before infection, prevented infection in 63% of sheep and lowered intensities in the G. I. Pozniak remaining ones by 99%.

592—PASKALSKAYA, M. Y., 1959. [The treatment of monieziasis in sheep in the Kupino district.] Veterinariya, 36 (10), 21-23. [In Russian.]

Paskalskaya reports her results in control of *Moniezia* infestation of sheep in the Novosibirsk area. She gave four doses of a 1% solution of copper sulphate as follows: the first in the last ten days of May or the first ten days of June and the subsequent doses at 25 to 30-day-intervals thereafter. This treatment, accompanied by improvement in feeding and general management, was found very effective.

C. Rayski

593—PELLEGRINI, N., 1957. [Istituto di Patologia Generale e Anatomia Patologica Veterinaria.]
"Epitelioma esofageo in pecora con infestione da Gongylonemi." Annali della Facoltà di Medicina Veterinaria. Pisa, 10, 58-68. [English & French summaries p. 67.]

Pellegrini describes the microscopic and macroscopic aspects of oesophageal epithelioma in a case of Gongylonema scutatum infection in sheep. He concludes that under predisposing conditions, such as hypovitaminosis A, heavy infection with Gongylonema can lead to changes in the oesophageal mucous membrane with blastoma-like lesions.

594—PETROVIĆ, K., 1958. [Veterinarski Institut NRS.] "Naša iskustva u suzbijanju želudačno-crevne strongiloze kod ovaca na jednom poljoprivrednom dobru." Veterinarski Glasnik, 12 (9), 703–707. [French summary pp. 706–707.]

At the end of June 1957, Petrović drenched a total of 1,228 sheep and lambs with phenothiazine, at a dose of 25 gm. per sheep and 10-15 gm. per lamb. The animals were in poor condition due to under-nourishment and were infected with gastro-intestinal strongyles, lungworms and Moniezia. Pasture rotation was applied concomitantly with the therapy. Mortality was much higher amongst lambs than amongst sheep. Phenothiazine treatment was repeated for lambs at the end of July. Following this period mortality was reduced from 20% to 8% amongst sheep and from 78% to 45% amongst lambs. As mortality still remained high amongst lambs, these were treated with iodine preparations. Only single fatal cases were recorded from October until the end of the year. The author concludes by stressing the N. Jones importance of prophylaxis.

595—PIEROTTI, P. & BOTTI, L., 1957. [Istituto di Patologia Generale e Anatomia Patologica e Centro Italiano di Idatidologia.] "Rottura della ciste da echinococco nei dotti biliari dell'ovino. I. Modalità di rottura." Annali della Facoltà di Medicina Veterinaria. Pisa, 10, 42–47. [English & French summaries pp. 46–47.]

Pierotti & Botti discuss factors predisposing to the rupture of hydatid cysts into the bile-ducts of sheep. The most important factor is the incorporation of collateral bile-ducts into the adventitious membrane, thereby reducing its thickness.

596—SCHANZEL, H., 1959. [Katedra Parazytologii i Chorób Inwazyjnych Wydział Weterynarjyny WSRL, Brno, Czechoslovakia.] "O zależności między wiekiem owiec a inwazją nicieni płucnych." Medycyna Weterynaryjna, 15 (2), 79-81. [German & Russian summaries p. 81.]

Schanzel has studied the relationship between lungworm infection and age in sheep. He found that, although the rates of infections were similar in the two groups, the intensity of Dictyocaulus filaria infection in adults was half that in yearlings, that of Protostrongylus kochi twice and that of Müllerius capillaris six-and-a-half times as great. He explains this increase in infection with increasing age in sheep, despite existing immunity, by the long life of the worms. G. I. Pozniak

597—SHOHO, C., KEERTHISINGHA, P. & NAIR, V. K., 1958. [Veterinary Research Laboratory, Peradeniya, Ceylon.] "Studies of cerebro-spinal nematodiasis in Ceylon VI. (1) Observations on new born kids with locomotor inco-ordination. (2) A transmission trial of C.S.N. on a suckling kid of the susceptible breed (Jamnapari)." Ceylon Veterinary Journal, 6 (3/4), 39–42.

(1) Shoho et al. made detailed examinations of the central nervous system of three kids showing locomotor disturbance and found that none of the three was suffering from cerebrospinal nematodiasis. (2) The authors also inoculated experimentally a suckling kid and four control goats with infective larvae of Setaria digitata; although the control animals developed typical symptoms of cerebrospinal nematodiasis, no significant signs of the disease were shown by the experimental kid during the 85 days before its life was prematurely terminated by enteritis. These observations support the prevalent view that suckling kids do not suffer from cerebrospinal nematodiasis.

598—ŠIBALIĆ, S. & CVETKOVIĆ, L., 1958. [Institut za invasione bolesti Veterinarskog fakulteta, Beograd.] "Promena boje mleka i mlečnih proizvoda posle lečenja ovaca fenotiazinom." Veterinarski Glasnik, 12 (4), 270-274. [French summary p. 274.] Šibalić & Cvetković fed phenothiazine to lactating sheep at a single dose of 18 gm.-20 gm.

of Phenovis. As a result of this treatment the following observations were made: (i) oxidation

products of phenothiazine-thionol appeared in the milk exposed to the light and air for 48 hours following the treatment; (ii) milk and its products (curdled milk and cheese) were coloured from bright red to dark violet, due to these phenothiazine derivatives; (iii) the red colour did not appear in fresh and curdled milk when milk from treated sheep was mixed with that of untreated sheep or with cow's milk in the proportion of 1:4; (iv) to avoid colouring of cheese this proportion had to be 1:9; (v) the oxidation products were principally found in the milk's proteins; (vi) the red colour was hardly perceptible in the cream, and whey was not coloured at all; (vii) cheese, made with milk from phenothiazine-treated sheep, when preserved in wooden containers for six months, acquired a red colour as soon as it was exposed to the light and air.

N. Jones

599—SWART, F. J. W., 1958. [Instituut voor moderne veevoeding "de Schothorst", Hoogland, Holland.] "Maagdarmstrongylose bij schapen en geiten." Tijdschrift voor Diergeneeskunde, 83 (5), 196–201.

In a paper on gastro-intestinal strongylosis in sheep and goats, Swart outlines the available information on its causes and effects, and on the influence of feeding on the condition. He records the findings in experiments carried out by him in 1955 and finishes the paper by outlining practical methods of control. The addition of cobalt alone to the ration appears to increase the fertility of female *Haemonchus contortus*. Lambs fed on concentrate supplements are better able to resist worm infections than those fed on hay alone; but infected lambs eat less than the worm-free controls and are also unable to digest proteins with equal efficiency. The addition of bone-meal and cobalt appears to increase resistance to worms and to maintain appetite. Experiments showed that in heavily infected animals which refused concentrates the blood phosphorus level was high. The copper content of blood and liver in infected animals fell, while in animals on the same pasture but with increased resistance to strongyle infections it was normal. Rotational grazing and avoidance of overcrowding on pastures is advised. To ensure efficiency of phenothiazine it should be administered with equal amounts of sodium bicarbonate or milk in order to bring it directly into the abomasum.

W. M. Fitzsimmons

600—THOMAS, R. J., 1959. "The use of low level phenothiazine in a salt-bone meal lick for the control of internal parasites in sheep." Journal of the South African Veterinary Medical Association, 30 (3), 319-333.

Thomas carried out this trial in the Eastern Transvaal highveld. He selected two comparable flocks, each of 25 ewes and 25 lambs, carrying mixed infections of Haemonchus contortus, Trichostrongylus colubriformis and Oesophagostomum columbianum. The flocks were kept under identical conditions, except that one flock received a salt and bone-meal lick, containing 10% phenothiazine, each animal obtaining approximately 0.5 gm. phenothiazine daily, while the second flock received a lick without phenothiazine. The lick was fed dry in shallow open troughs on the ground. Thomas found, over an 11-month period, in the flock receiving small daily doses of phenothiazine, that there was a general reduction of worm egg output of up to 90%, that larval culture showed 80% inhibition of larval development, that there were high weight gains and an absence of clinical disease as compared with the untreated flock, and that low level phenothiazine did not eliminate the worm burden. There was a gradation in effectiveness against Trichostrongylus colubriformis, Haemonchus contortus and Oesophagostomum columbianum, similar to that found with therapeutic dosing. The only major disadvantage of this regime was a marked staining of the wool of the head and shoulders attributed to the fine particles of phenothiazine being blown into the fleece, and Thomas makes suggestions C. Hatch for overcoming this difficulty.

601—TURNER, J. H., 1959. [Animal Disease and Parasite Research Division, Agricultural Research Service, U.S. Department of Agriculture, Beltsville, Maryland, U.S.A.] "Experimental strongyloidiasis in sheep and goats. III. An attempt to induce passive immunity in lambs; changes in serum proteins after infection; and effect of immune serum on infective larvae." Proceedings of the Helminthological Society of Washington, 26 (2), 114-124.

Turner found that β - and γ -globulins in the sera of lambs rose during infection with *Strongy-loides papillosus*. Highest concentrations of β -globulin were obtained in the third week, whereas

peak concentrations of γ -globulin were reached in the sixth week. Oral and anal precipitates formed on larvae when they were incubated in immune serum in vitro and the larvae appeared to be dead after 22 hours. However, attempts to transfer immunity to four lambs by single injections of immune serum failed. The author suggests that although antibodies developed in the blood, the acquired immunity to S. papillosus was localized mainly in the small intestine. W. P. Rogers

602—VUJIĆ, B. & ANIĆ, N., 1957. [Veterinarski Institut N.R.S., Beograd.] "Lečenje fenotiazinom i njegove propratne pojave kod ljudi i životinja." Veterinarski Glasnik, 11 (12), 1177–1180. Vujić & Anić report that in the course of drenching a great number of sheep with phenothiazine, cases of inflammation of the exposed parts of the skin, headaches, vomiting and swelling of eyelids, were observed among the staff. This occurred in July and could be prevented by not inhaling phenothiazine powder and by avoiding direct sunlight. N. Jones

603—VUJIĆ, B. & ANIĆ, N., 1958. [Veterinarski Institut N.R.S., Beograd.] "Prilog upoznavanju nekih šteta od subkliničkih parazitoza ovaca." Veterinarski Glasnik, 12 (8), 604–608. [English summary p. 608.]

summary p. 008.]

Vujić & Anić treated 188 sheep in three different flocks, in which the presence of parasites was discovered by autopsy of some of the animals. Phenothiazine, hexachlorethane and carbon tetrachloride were used at the following total respective doses: 20 gm. to 25 gm.; 20 c.c. to 25 c.c. (orally) and 5 c.c. (subcutaneously). The dominant helminthiases were fascioliasis in the first flock, trichostrongylosis in the second and both infections equally in the third. The gain in weight per animal, resulting from the treatment, as observed 35, 30 and 47 days after the treatment in the respective flocks was 0.4 kg. in the first, 1.5 kg. in the second and 1.03 kg. in the third flock. For each treated group of animals there was a control group. 132 days after the treatment the difference in weight between the treated and the control animals was greatly reduced. This was shown by autopsy to be due to reinfection.

N. Jones

604—WHITLOCK, H. V., 1959. [McMaster Laboratory, Division of Animal Health and Production, C.S.I.R.O., Parramatta Road, Glebe, N.S.W., Australia.] "The recovery and identification of the first stage larvae of sheep nematodes." Australian Veterinary Journal, 35 (7), 310-316.
Nematode eggs, recovered from sheep faeces by flotation in sugar solution, are incubated in water on a plug of cotton wool near the top of a glass column 25 cm. long. Larvae which hatch and pass the cotton plug are killed by iodine in solution at the bottom of the column. Measurements and drawings are given of first-stage larvae derived from single species infections in sheep. First-stage Strongyloides papillosus were shorter than larvae of all other species examined. Trichostrongylus and Ostertagia spp. had short tails, but the mean over-all length of Ostertagia spp. was 50 μ greater than that of Trichostrongylus spp. Larvae with medium length tails included Haemonchus placei, H. contortus, Cooperia punctata and C. pectinata. Species which had long-tailed first-stage larvae were Oesophagostomum venulosum, O. columbianum and Chabertia ovina.
R. I. Sommerville

605—YAKOVENKO, P. F., 1959. [Carbon tetrachloride against fascioliasis in sheep.] Veterinariya, 36 (9), 33. [In Russian.]

Intramuscular injection of equal parts of carbon tetrachloride and vaseline in doses of 2 ml. for lambs and 3 ml. for sheep as recommended by Kazakov & Zotov [for abstract see Helm. Abs., 24, No. 680b] was tested against fascioliasis on a large number of animals. After two to four weeks 16% of the sheep gave positive faecal tests and in 21% live worms were found on autopsy. Increased doses of 3 ml. for lambs and 4·0–4·5 ml. for sheep gave negative faecal tests from the ninth day after treatment and no live worms were found in slaughtered sheep in the course of two months' follow-up. No side effects were observed, but the treatment should not be frequently repeated.

G. I. Pozniak

Pigs (Swine)

See also Nos.: 438, 464, 473, 499, 510, 661, 662, 664, 671, 672, 681, 684, 686, 689, 690, 873, 876, 901, 929, 951.

606—BATTELLI, C. & GIANNUBILO, M., 1958. "Impiego del tetracloruro di carbonio per via sottocutanea in prove pratiche di terapia contro la bronchite verminosa dei suini." Veterinaria Italiana, 9 (9), 778–784.

Battelli & Giannubilo treated pigs against verminous bronchitis with subcutaneous injections of carbon tetrachloride. The drug was diluted in the ratio of 1:3 with sterile olive oil and applied at doses ranging between 3 ml. and 8 ml. to 33 pigs of 10 kg. to 35 kg. body-weight. Verminous bronchitis due to several species and, in one case, only to *Metastrongylus elongatus*, had been found among this herd. The above treatment was repeated for 29 of the animals within eight days. 31 of the 33 recovered and two died. In another herd 135 pigs of 50 kg. to 60 kg. body-weight also received the carbon tetrachloride and olive oil mixture subcutaneously, but in a single dose of 10 ml. The treatment was well tolerated and mortality was arrested.

607—BOKO, F. & BARIŠIĆ, S., 1958. "Prilog poznavanju ehinokokoze kod svinje." Veterinarski Glasnik, 12 (7), 508-512. [French summary p. 512.]

Boko & Barišić describe a case of hydatid disease in a six to seven-month-old pig. The liver, lungs, spleen, kidneys, heart and peritoneum were covered with hydatid cysts, many of which contained endogenous and exogenous brood capsules. From the varying sizes of the cysts the authors conclude that primary and secondary hydatids were present.

N. Jones

608—EMDIN, R., 1957. [Cattedra di Parassitologia.] "Sulle alterazioni dei linfonodi periepatici nell'epatite parassitaria eosinofilica a focolai nel suino." **Annali della Facoltà di Medicina Veterinaria. Pisa, 10,** 237–242. [English & French summaries p. 242.]

Emdin gives a detailed description of the changes in the portal lymph nodes of pigs with parasitic hepatitis, which he attributes to an inflammatory process caused by a parasite. [The possible identity of the causative organism is nowhere either stated or implied; but various helminth parasites are known to migrate through the liver.]

N. Jones

609—KOSMINKOV, N. E., 1959. [Moskovski tekhnologicheski institut myasnoi i molochnoi promishlennosti, Moskva.] [The results of comparative examinations for *Trichinella* in the superficial muscles of pigs.] **Veterinariya, 36** (9), 52–54. [In Russian.]

To speed up the examination of pigs in abattoirs for *Trichinella*, the frequency of infection of organs other than the diaphragm was investigated. These were the oesophagus, tongue, masticatory muscles, neck, throat, feet, tail and ears. The number of specimens examined was four times greater than is usual in trichinelloscopy. Only the diaphragm was positive in all the 29 pigs examined, with an average of 16 larvae per carcass. The oesophagus, however, showed larvae in 28 of the animals with an average of eight per carcass. Samples of the oesophagus can be obtained seven to eight minutes before those of the diaphragm and consequently the test results are ready before the separation of the internal organs, trotters and head.

G. I. Pozniak

610-LUKS, J., 1959. "Częstość występowania bąblowców wątroby u świń." Medycyna

Weterynaryjna, 15 (2), 93–95. In view of the growing frequency of reports of hydatidosis and cysticerciasis in man, Luks investigated, by noting even single cysts, the real infection of pigs at the Elblag slaughterhouse, which deals with animals from this town and the surrounding district. A representative set of results showed that 46% of 5,841 livers examined harboured cysts of which about half were viable, while only 5.7% of the livers were rejected by the slaughterhouse. The infection in 670 livers examined was composed as follows: 226 Cysticercus tenuicollis, 200 Echinococcus granulosus, 53 mixed C. tenuicollis and E. granulosus, and 191 calcified cysts.

611—PROST, E., 1959. [Katedra Higieny Produktów Zwierzęcych, Wydział Weterynaryjny, Lublin, Poland.] "Badania nad wartością metody trychinoskopowej i metody trawienia w wykrywaniu włośnicy u świń rzeźnych." Medycyna Weterynaryjna, 15 (2), 88–92. [German & Russian

summaries p. 92.]

A comparison was made of trichinoscopy and the digestion method for the detection of light infections with Trichinella spiralis in pig muscle. 99 series (comprising 14 samples) were examined by each method, larvae being detected in 71 of the series by trichinoscopy and in 96 by the digestion method. In the case of diaphragm muscles from 1,000 slaughtered pigs trichinoscopy was negative in all cases, whereas the digestion method (using 10 gm. samples) showed small numbers of larvae to be present in 0.3%. Thus, the digestion method is the more reliable, but it, too, can fail if larvae are unevenly distributed in the muscle tissue.

612—STEWART, T. B. & JONES, D. J., 1959. [Animal Disease and Parasite Research Division, Agricultural Research Service, U.S. Department of Agriculture, Tifton, Georgia, U.S.A.] "Occurrence of the lung fluke Paragonimus rudis (Diesing, 1850) in native pigs in Georgia." Journal of Parasitology, 45 (5), 548.

Adult flukes identified as Paragonimus rudis (syn. P. kellicotti) were recovered from the lungs of a pig farrowed and raised on a farm near Fitzgerald, Georgia. This is stated to be the first authentic record of Paragonimus from a native domestic animal in Georgia.

613—VUČKOVEČKI, V., 1958. "Prilog liječenju askaridoze svinja natrijevim fluoridom." Veterinarski Glasnik, 12 (1), 31-35.

Vučkovečki treated 42 nine-week-old pigs with sodium fluoride; 83·2% of them eliminated Ascaris eggs in the faeces. 0.14 gm. of the drug per kg. body-weight was given in the food in two divided doses on the same day. Two of the treated pigs died 4 and 26 days respectively after treatment; another animal received only the first half-dose (on account of side effects). No side effects were noted among the rest of the treated animals. The efficacy of the drug, as calculated on the remaining 39 animals, at different intervals after treatment was 82% after 13 days, 95% after 24 days, 82·15% after 37 days and 74·3% after 57 days. The intensity of infection was proportional to the incidence of infection. N. Jones

614-WILKINSON, F. C., 1958. "Worms in pigs." Journal of Agriculture of Western Australia, 3rd series, 7 (3), 303-306.

Wilkinson gives some practical advice concerning Ascaris lumbricoides infection in pigs. He describes the symptoms, diagnosis and treatment of this infection as well as the life-cycle of the parasite. Sodium fluoride and piperazine are recommended in practical doses as treatment and the MacLean County System for the prevention of infection among young pigs. N. Jones

Elephants

See No. 670.

Camels and Llamas

615-JANSEN, Jr., J., 1959. [Institute of Veterinary Parasitology and Parasitic Diseases, State University, Utrecht, Netherlands.] "Auchenia glama and Antilope cervicapra, new hosts for some Trichostrongylidae." Journal of Parasitology, 45 (5), 509.

The trichostrongylids found in a llama which died at a zoological garden in Holland were Ostertagia leptospicularis, O. mossi, O. circumcincta, O. trifurcata, Teladorsagia davtiani, Grosspiculagia lasensis, Camelostrongylus mentulatus, Spiculopteragia spiculoptera, S. asymmetrica, Apteragia quadrispiculata and Trichostrongylus axei. All appear to be new for this host. T. axei, T. vitrinus, T. colubriformis, T. probolurus, C. mentulatus and Nematodirus spathiger were found in an antelope, the last three being new for this host.

Rabbits and Hares

See also Nos.: 868, 977.

616-BULL, P. C., 1959. [D.S.I.R., Animal Ecology Section, Wellington, New Zealand.] "A seasonal sex difference in the infestation of rabbits with the nematode Trichostrongylus retortaeformis (Zeder,

1800)." [Correspondence.] Nature. London, 184 (4682), 281-282.

The abundance of Trichostrongylus retortaeformis was assessed in samples of wild rabbits collected every four weeks throughout a full year in a district near Napier in the North Island of New Zealand. In all, 1,072 rabbits were examined. During March-September levels of infection were significantly higher in male rabbits than in females but this relationship was reversed during October-February, a period that covers the middle and end of the rabbits' breeding season. Males at this time, but not females, had much lower infections than during the winter. A further 768 rabbits collected in this and other districts in subsequent years showed that the above seasonal changes are both regular and wide-spread. In young female rabbits infections were higher in pregnant than in non-pregnant animals, but sex of host had little effect on infections in sexually immature rabbits. Bull considers that the varying levels of worm infection are due to variations in host resistance rather than in opportunity to acquire infection. P. C. Bull

Cats and Dogs

See also Nos.: 431, 433, 464, 469, 473, 477, 496, 498, 503, 650, 663, 664, 674, 681, 683, 684, 694, 831, 837, 871, 872, 899, 911, 915, 942, 958, 966.

617—BOTTI, L., 1957. [Istituto di Patologia Generale e Anatomia Patologica Veterinaria e Cattedra di Parassitologia della Università di Pisa.] "Sui nodulini miliarici parassitari in rene di cane. Identificazione delle forme larvali infestanti e riproduzione sperimentale." Atti della Società Italiana delle Scienze Veterinarie, 11, 737-740. [English & French summaries p. 740.]

Botti describes the nature of miliary nodules in dogs' kidneys, due to the presence of Toxocara canis larvae. The lesions are classified as three types, having such common characteristics as sub-capsular localization in most cases, fibroblastic reaction with tendencies to necrosis and calcification, infiltration by histiocytes and plasmocytes. Tubular structures in the process of regression, or traces of such structures could be found in most granulomatous formations. The main differences between those types of nodules were: the presence of well preserved T. canis larvae in the first type and a thick encapsulation of the necrotic zone in the second type. The third type was composed exclusively of connective tissue, scarcely infiltrated by histiocytes and plasmocytes and, occasionally, with a calcified centre. The author experimentally infected per os some puppies with embryonated eggs of T. canis. As a result of this similar nodules were recovered from the renal cortex at 20 days, one month, two months and later. Some well preserved larvae were also found in more fresh, first-type nodules. Miliary nodules were recovered from all experimental animals.

618—CORSALINI, T., 1958. [Istituto Zooprofilattico Sperimentale, Foggia.] "Indagini sulla frequenza di Echinococcus granulosus nei cani di Bari." Veterinaria Italiana, 9 (6), 457-459. [English,

French & German summaries p. 459.]

Corsalini reports that out of 126 dogs which he examined post mortem 14.28% were found to be infected with Echinococcus granulosus. The infection was predominant among the large races. The results of similar investigations in Matera and Foggia are also given. The incidence of Echinococcus was 14% out of 150 dogs from Matera and 10·18% out of 91 dogs from Foggia. [The figures given in the tables and in the summaries are not wholly consistent with those N. Iones given in the text.]

619—DOW, C., JARRETT, W. F. H., JENNINGS, F. W., McINTYRE, W. I. M. & MULLIGAN, W., 1959. [Department of Veterinary Medicine, University of Glasgow, Bearsden, Glasgow, Scotland.] "The production of active immunity against the canine hookworm *Uncinaria stenocephala.*" Journal of the American Veterinary Medical Association, 135 (8), 407-411.

Dow et al. describe experiments in which 12 hookworm-free mongrel bitch pups, eight to twelve weeks old (group A), were each given by stomach tube 1,000 infective larvae of Uncinaria stenocephala which had been irradiated with 40,000 roentgens. Twelve similar animals (group B) were each given 1,000 normal infective larvae, while six further animals

(group C) were left uninfected as controls. After 14 to 20 days intestinal worm counts showed a mean of 130 ± 29 in group A, whereas in group B the mean was 746 ± 32 . After 128 days all surviving animals were challenged with 1,000 normal infective larvae. Autopsy 22 days later revealed a mean worm burden of 32 in group A, of 186 in group B, and of 530 in group C. The authors conclude that an infection with U. stenocephala produces a degree of resistance to re-infection and that irradiated larvae are also capable of giving rise to marked immunity. The significance of these results in relation to practical vaccination measures and to fundamental immunity problems in parasitic diseases is discussed.

J. M. Watson

620—GRAÑA, A. DA, 1958. [Clínica médica y quirúrgica de animales pequeños.] "Observación sobre muestras de materias fecales procedentes de perros 'con dueño' en la ciudad de Buenos Aires, en relación con la Taenia Echinococcus granulosus." Revista de la Facultad de Agronomía y Veterinaria. Buenos Aires, 14 (2), 306-307. [English summary p. 307.]

Veterinaria. Buenos Aires, 14 (2), 500-507. [English summary p. 507.]

Each of 30,000 faecal samples from dogs brought to a hospital for small animals in Buenos Aires, between 1932 and 1957, was examined macroscopically and by concentration techniques but none showed infection with *Echinococcus granulosus*. These animals were in the care of owners and came almost without exception from the capital city. 4,500 of the dogs, which had symptoms of tapeworm infection, were given by mouth 0.005 gm. to 0.08 gm. of arecoline hydrobromide or hydrochloride, but faecal examination after treatment revealed no infection with *E. granulosus*.

M. McKenzie

621—LAING, A. D. M. G., 1959. [Superintendent of Hydatid Control, Department of Agriculture, Wellington, New Zealand.] "Progress in eradicating hydatids in N.Z." New Zealand Journal of Agriculture, 98 (6), 559–561.

It is suggested that small numbers of New Zealand farmers have controlled *Echinococcus granulosus* for years, but the general farming community became alive to the problem only in 1959. Hydatid control committees at the community level have developed more or less spontaneously within various counties. They are encouraged by the Department of Agriculture with a setting-up grant of £50, and are empowered to raise finance for hydatid eradication by levying up to £1 per dog per year, with a maximum of £5 per owner. This money is used primarily to employ a Hydatid Control Officer, generally one to a county, who records dogs, administers vermifuges, collects the faecal purges and dispatches them to a central diagnostic laboratory for tapeworm identification. The efforts of the various groups are co-ordinated by a National Hydatid Committee.

G. K. Sweatman

622—MANTRAMURTI, I. D. & RANGANATHAN, M., 1959. [Madras Veterinary College, Madras, India.] "Gastro-enteritis in dogs." Indian Veterinary Journal, 36 (10), 478–489. Mantramurti & Ranganathan remark inter alia that nearly 90% of dogs in Madras City suffer from hookworm infection and that ascariasis and tapeworm infections are also common in these hosts. Standard treatments are recommended. The authors consider that worm infection and indiscriminate feeding are the principal causes of gastro-intestinal disorders, which are rare in animals over two years old.

J. M. Watson

623—NARDI, E., 1959. [Istituto Zooprofilattico Sperimentale, Teramo, Italy.] "Su di un trematode parassita intestinale del cane e della volpe." Veterinaria Italiana, 10 (2), 158–162.

Nardi reports on the finding of Parascocotyle sp. (Stunkard & Haviland, 1924) from the small intestine of four out of ten foxes and two out of five dogs near Foggia. It is concluded that the characteristic data (which are given in the text with an illustration) are not sufficient to place this trematode in any particular species of the above genus. The author suggests, however, that it could be eventually identified as P. italica.

N. Jones

624—NENADIĆ, M. B., 1958. [Veterinarski Stanica, Pljevlja.] "Neka iskustva pri arekolinizaciji pasa području sreza Pljevlja." Veterinarski Glasnik, 12 (9), 731–732.

Nenadić describes the use of arecoline against *Echinococcus* in dogs, in the district of Pljevlja (Yugoslavia).

N. Jones

625—OISHI, I., KOBAYASHI, S. & KUME, S., 1958. [On the parasitic conditions of canine filariae.] Journal of the Japanese Veterinary Medical Association, 11 (1), 10–12. [In Japanese.] Dogs were examined in the Tokyo district for filarial infection. 59·1% of them were found to have filariae. Among these, 81·2% were infected with both male and female worms, and the rest with either sex. In the former case, the average number of adult worms was 12 with equal numbers of males and females, while in the latter, the number of worms found averaged 1·9 with five males to every six females. The immature form was found from the end of November to early March, and 37·7% of the infected dogs were found to have the immature worms during these months.

626—OISHI, I. & KUME, S., 1958. [Studies on the diagnosis of canine filariasis. I. An induction method with Spatonin.] Journal of the Japanese Veterinary Medical Association, 11 (2), 69-72.

[In Japanese.]

The technique of induction of microfilariae into the blood stream by the use of Spatonin was examined. A dose of 30 mg. per kg. body-weight followed by blood examination 30 minutes later was found to be most satisfactory.

Y. Yamao

627—OTT, H. I. & BOWER, S. E., 1959. [Norwalk, California, U.S.A.] "Lungworms in a dog." Journal of the American Veterinary Medical Association, 134 (10), 471.

This is a clinical report of a dog infected with Capillaria aerophila.

K. Heath

628—PAGGI, L., 1959. [Istituto di Parassitologia dell'Università di Roma.] "Segnalazione, in Italia Centrale, di *Troglostrongylus* sp. parassita dei pomoni di felidi." **Parassitologia. Rome, 1** (1), 80–81.

Two cats, one of which was certainly wild, the other a domestic cat which had gone wild, had bursate nematodes in the bronchi. The worms had many of the characteristics of *Troglostrongylus brevior* (Gerichter) but there were some differences from the original description and Paggi states only that *Troglostrongylus* sp. has been found.

W. K. Dunscombe

629—PAPASPYROU, S., 1957. [Section de Maladies Contagieuses et Parasitaires au Ministère de l'Agriculture.] [Fréquence de l'infestation du chien par le taenia échinocoque dans diverses régions de la Grèce, prophylaxie et médication anthelminthique.] Bulletin de la Société Vétérinaire Hellénique. Série B, No. 28, pp. 166-174. [In Greek: French summary pp. 173-174.]

Papaspyrou gives the results of a survey of *Echinococcus granulosus* infection in dogs in Greece. The average infection was found to be $24\cdot4\%$, based on autopsies and faecal counts. Figures in rural areas were higher. The reasons for this are discussed at length. Papaspyrou states that the dog is the principal factor in the maintenance and spread of *E. granulosus* in man and animals, along with other wild carnivores. This does not apply to the cat. Measures to counter the parasites are proposed and described. These include meat inspection and destruction of infected organs, burial of the carcasses of animals, reduction in the numbers of dogs by destruction of strays and the registration of essential dogs, obligatory treatment of dogs with anthelmintics, and wide-spread measures to educate the public. The use of arecoline hydrobromide at a rate of 4 mg. per kg. body-weight orally in 1% aqueous solution, or Nemural tablets at a rate of 6 mg. per kg., is advocated. A second treatment is said to be necessary in the case of arecoline hydrobromide. Two cases are described where live parasites were found on autopsy after treatment, and Papaspyrou therefore stresses the need for more effective, more economical and more easily administered taeniafuges.

630—RILEY, S. F., 1959. [Police Dog Section, Police Department, New Zealand.] "Farm dogs could be trained in food refusal to aid hydatids eradication." New Zealand Journal of Agriculture, 98 (5), 495–496.

Riley suggests that dogs could be trained to refuse offal as a method of controlling hydatid in ction.

J. M. Watson

63) —ROSA, W. A. & NIEC, R., 1959. [Técnicos del Instituto de Patología Animal, Argentina.] "Hymenolepis diminuta (Rudolphi 1819) en perro." Revista de Investigaciones Ganaderas. Buenos Aires, No. 5, pp. 19–25. [English summary p. 25.]

Ova of Hymenolepis diminuta were found in the faeces of a five-month-old puppy. This infection does not seem to have been reported previously in Argentina. W. K. Dunscombe

632—SCHOR, S. M., 1959. [East Orange, New Jersey, U.S.A.] "Toxascaris leonina in a cat." Journal of the American Veterinary Medical Association, 135 (6), 328.

633--SENEVIRATNA, P., 1958. [Department of Veterinary Science, University of Ceylon, Peradeniya, Ceylon.] "Parasitic bronchitis in cats in Ceylon." Ceylon Veterinary Journal, 6 (3/4), 36-38. 60% of the cats in Ceylon examined by the author were infected with Anafilaroides rostratus. The intermediate hosts in Ceylon were the common snails Achatina fulica, Mariella dussumieri and Laevicaulis alte. The infective stage is reached in about 30 days under normal conditions. Chickens and mice are thought to act as transport hosts and to play an important part in the dissemination of the parasite. Diagnosis of infection can be done by examination of faeces using the Baermann technique. Pathogenicity of infection is chronic bronchitis and peribronchitis with marked hyperplasia of the bronchial mucosa. Coughing, eosinophilia and nasal discharge are other symptoms. The recommended treatment is five injections of antimosan, intramuscularly every fourth day at a dosage rate of 0·2 c.c. per kg. body-weight together with piperazine hydrate at a dosage of 50 mg. per kg. for two to three weeks. Preventing cats from eating snails or rodents and birds likely to harbour the parasite and the cleaning of catteries with 0·5% lysol is also recommended.

K. Heath

634—ZAPPA, A., 1958. [Istituto di Patologia Speciale e Clinica Medica Veterinaria della Università di Milano.] "Anchilostomiasi in patologia canina. (Contributo clinico-terapeutico)." **Nuova Veterinaria, 34** (11), 256–260.

Zappa describes the treatment of three dogs, one of which had *Ancylostoma* and *Trichuris* infection, another *Ancylostoma* and *Ascaris* and the third a heavy *Ancylostoma* infection. Each animal received five capsules of Hidroxylen Kuba of the following composition: hexylresorcinol 0·1 gm., tetrachlorethylene 0·65 gm., chenopodium oil 0·038 gm., medical chlorophyll 0·04 gm., pistachio nut oil 0·64 gm. and gelatin 0·1 gm. Control examinations were negative in the case of the first two dogs, seven days and two months after treatment respectively. Coprological examination of the third dog, 12 days after treatment, showed a very important reduction in the number of eggs. The author mentions some other similar cases. Seven of these were completely cured of ancylostomiasis by one such treatment, but in three others the treatment had to be repeated 25 days later.

N. Jones

Fur-Bearing Animals

See also Nos.: 663, 674, 683, 877, 910.

635—PETROV, A. M. & BOROVKOVA, A. M., 1958. [The seasonal dynamics and the determination of the best time for treating toxascariasis in young blue Arctic foxes.] Byulleten Nauchno-Tekhnicheskoi Informatsii Vsesoyuznogo Instituta Gelmintologii im. Akademika K.I.

Skryabina, No. 4, pp. 68-70. [In Russian.]

In adult blue foxes, in which the peak of *Toxascaris* infection occurs in December-February, the twice-yearly ascaricidal treatment practised in Russia (in February and after the vixen and cubs have been separated), is appropriate. In cubs, however, where eggs were first detected in the faeces at the end of June and their number rose to a maximum in August, treatment should be made 70 to 80 days after birth and repeated in two weeks and not 20 to 25 days after birth as instructed. This latter period is suitable for *Toxascaris* but not *Toxascaris*.

G. I. Pozniak

636—ROMANOV, I. V., 1959. [Kafedra obshchei biologii Gorkovskogo gosudarstvennogo meditsinskogo instituta.] [Dependence of the helminth fauna of sables in the Krasnoyarsk Territory on environmental conditions.] Zoologicheski Zhurnal, 38 (9), 1313–1321. [In Russian: English summary p. 1321.]

The influence of various factors on the helminth fauna was studied on 305 sables in several areas of Krasnoyarsk. Young sables (less than one year old) were more susceptible to infection than older ones, although with some infections incidence rose again in the oldest animals. Males were more frequently infected than females (by 9.6%). Sables on a good diet harboured less worms than those on a mediocre or poor diet (e.g. 2.75 to 12.0 and 28.5 to 30.2

Capillaria putorii per animal respectively in the Taseevsk area). A high proportion of cedar nuts in food was associated with low incidence of infections. High population densities produced higher infection rates. Thus in the Taseevsk area (three to four sables per sq.km.) the number of helminth species per animal was more than double and the infection rate exceeded by 13% that of the Boguchansk area (1.5 to 1.7 sables per sq.km.). Northern areas of Krasnoyarsk with a more severe climate were less favourable to helminths than southern areas but there was no appreciable variation in any one area in different years.

G. I. Pozniak

637—SEMELLINI, L., 1958. [Istituti di Clinica Medica e Malattie Infettive della Facoltà di Medicina Veterinaria della Università di Parma.] "Alcune osservazioni sulla patologia spontanea del nutria (Myopotamus coypus Mol.) allevato in cattività." Nuova Veterinaria, 34 (4), 76–84. [English, German & Spanish summaries p. 84.]

Semellini after referring at length to the work of others on the breeding of nutria (Myocastor coypus) and diseases occurring among them, reports on his own findings of trichostrongylosis among these animals bred in captivity in the provinces of Parma, Piacenza and Reggio Emilia. Without suggesting any explanation for the phenomenon, the author reports that trichostrongylosis was frequently associated with salmonelliasis.

N. Jones

638—SZUPERSKI, T., 1959. [Wydział Weterinaryjny, Wyższa Szkoła Rolnicza, Lublin, Poland.] "Objawy kliniczne, anatomo- i histo-patologiczne u lisów srebrzystych i piesaków po doświadczalnym i lecznicym stosowaniu adipinianu i fosforanu piperazyny." Medycyna Weterynaryjna, 15 (8), 513–515. [English & Russian summaries p. 515.]

Piperazine phosphate or adipate was given to silver and to blue foxes in doses of 0.5 gm. per animal daily for ten days without harmful side effects. However, doses of 1.5 gm. similarly applied caused degenerative changes, cellular infiltrations and congestion of the liver and kidneys, hyperaemia of the lungs, pancreas and spleen, and acute inflammation (sometimes haemorrhagic) of the intestinal mucosa. About 2,860 foxes were treated in the spring and autumn with 0.1 gm. of piperazine adipate per kg. body-weight in food, the dose being repeated twice at three-day intervals. Cubs received about 0.1 gm. per kg. body-weight 10 days (blue foxes) or three weeks (silver foxes) after their birth and again three weeks later. No harmful side effects were observed. The treatment was effective against *Toxocara canis* but only partly reduced *Uncinaria stenocephala*, *Trichuris vulpis* and *Ancylostoma caninum* infections.

G. I. Pozniak

Laboratory Animals

See also Nos.: 779, 830, 911, 912, 913, 914, 927, 950, 956, 961, 962, 963, 966, 967, 968, 969, 972, 973, 977.

639—BERNARD, G. R., 1959. [University of Notre Dame, Notre Dame, Indiana.] "Experimental trichinosis in the golden hamster. I. Spontaneous muscular activity patterns." American Midland Naturalist, 62 (2), 396–401.

The spontaneous activity of male hamsters, each infected with 225 Trichinella spiralis larvae, was compared with that of normal male hamsters. The animals were paired and placed in individual cages in a darkened room. Movements of the cages due to activity of the animals were automatically recorded on a kymograph drum over a fourteen-hour period every day. It was shown that five to seven days after infection, activity was reduced. After this time activity was normal or even above normal for about two weeks. Between the fourth and ninth weeks activity was considerably reduced. One animal which died during the experiment was relatively inactive throughout. Bernard suggests that the prolonged period of inactivity, which commenced about 30 days after infection, was due to local reaction, destruction and necrosis of the muscle fibres which follows invasion of the tissues by larvae. The preceding period of hyperactivity may have been caused by asthenia, hypersensitivity, or both.

I. E. D. Keeling

640—BOKO, F. & BELJIN, V., 1958. "Eksperimentalna ehinokokoza i Cysticercus fasciolaris kod laboratorijskih miševa." Veterinarski Glasnik, 12 (8), 594–598. [German summary p. 598.] Boko & Beljin fed to each of 50 white laboratory mice eight to ten specimens of Echinococcus granulosus. Thus each animal received 100 or more oncospheres with a high percentage of "formed embryos". The mice were kept in optimal conditions for reinfection for two months. At the end of the experiment autopsy revealed the presence of Cysticercus fasciolaris in the livers and not one E. granulosus. It appeared that though the experimental infection was unsuccessful the animals had become spontaneously infected with Taenia taeniaeformis, the eggs of which were present in the food (oats) together with cats' faeces. The authors conclude that: (i) it is very difficult to infect white laboratory mice with E. granulosus whereas it is easy to infect them with T. taeniaeformis; and (ii) unilocular and multilocular hydatid cyst are produced by different kinds of eggs.

641—DE MEILLON, B. & PATERSON, S., 1958. [Bilharzia Natural History Unit, South African Council for Scientific and Industrial Research, Johannesburg, South Africa.] "Experimental bilharziasis in animals. VII. Effect of a low-protein diet on bilharziasis in white mice." South African Medical Journal, 32 (45), 1086–1088.

De Meillon & Paterson found that a low protein diet caused mice infected with Schistosoma mansoni (Egyptian strain) to pass fewer eggs of the parasite in the faeces and to die earlier than uninfected ones, although there was no significant difference in rate of reproduction or weight gain in the two groups of mice. Male worms recovered from mice on the low protein diet were stunted and possessed abnormal reproductive organs. Abnormalities of reproduction in the parasite were considered more likely to be responsible for the paucity of eggs in the faeces of the experimental animals than any enhancement of defence mechanisms produced by the low protein diet. J. M. Watson

642-GAVEZ, E. & BOKO, F., 1958. [Zavod za higijenu i bolesti dom. životinja Poljoprivrednošumarskog fakulteta i Instituta za patomorfologiju Veterinarskog fakulteta Univerziteta u Sarajevu.] "Prilog ispitivanju toksičnosti i doze solucije lugola primjenjene s/c i i/p kod laboratorijskih miševa u hidatidološkom eksperimentu." Veterinarski Glasnik, 12 (5), 355–358. [French summary

pp. 357-358.]

Gavez & Boko administered Lugol's solution undiluted and diluted to white mice by subcutaneous and intraperitoneal injection. To establish the maximum tolerance, the first group of 10 mice (average weight 25 gm.), received subcutaneously 1 ml. of undiluted Lugol's solution, the second group of the same size received also subcutaneously the same quantity of solution, but diluted in re-distilled water in the proportion of 1:10. Two other similar groups of white mice received the two solutions in the same quantity intraperitoneally. All the animals that received 1 ml. of undiluted solution died within 24 to 48 hours; about 20% of those that received 1 ml. of diluted solution intraperitoneally died within two to three days. The rest of the animals survived and showed no visible ill effects. The tolerance of the intraperitoneal injections was half that of the subcutaneous injections. The authors conclude that diluted Lugol's solution could be safely used in required doses to prevent post-operational secondary hydatid disease in man. N. Jones

643—GOŁEBIOWSKI, S., 1959. [Wojewódzki Zakład Higieny Weterynaryjnej, Łódź, Poland.] "Inwazja motylicy wątrobowej u zwierząt laboratoryjnych." Medycyna Weterynaryjna, 15 (4), 210-212.

[English & Russian summaries p. 212.]

A fatal outbreak of Fasciola hepatica infection is reported at the Regional Department of Veterinary Hygiene in Łódź which killed 26 out of 27 experimental guinea-pigs and all of five experimental rabbits. The source of infection was traced to the hay used as fodder. All livers showed extensive cirrhosis and necrotic foci, and hyperplastic oedema was frequently seen in the spleen of the guinea-pigs.

644-HABERMANN, R. T. & FLETCHER, Jr., P. W., 1958. "The identification and control of helminths in laboratory animals." Journal of the National Cancer Institute, 20 (5), 979-1009. Habermann & Fletcher give notes on the diagnosis and control of common helminth infections in laboratory animals. Parasites described include: Hymenolepis nana, H. diminuta, Heterakis spumosa, Syphacia obvelata, Aspiculuris tetraptera and Trichosomoides crassicauda in the rat and mouse; Paraspidodera uncinata in the guinea-pig; Passalurus ambiguus in the rabbit; Oesophagostomum apiostomum, Strongyloides intestinalis and Capillaria hepatica in the Rhesus monkey; and Dipylidium caninum, Taenia pisiformis, T. taeniaeformis, Ancylostoma caninum, Trichuris vulpis, Capillaria felis-cati, C. aerophila, C. plica, Dirofilaria immitis and Aelurostrongylus abstrusus in the dog and cat. The paper is illustrated by nine plates. J. E. D. Keeling

Poultry

See also Nos.: 672, 677, 903.

645—FOSTER, W. B. & DAUGHERTY, J. W., 1959. [Department of Biology, The Rice Institute, Houston, Texas, U.S.A.] "Establishment and distribution of Raillietina cesticillus in the fowl and comparative studies on amino acid metabolism of R. cesticillus and Hymenolepis diminuta." Experimental Parasitology. New York, 8 (4), 413–426.

Foster & Daugherty found that Raillietina cesticillus became established in the small intestine

of White Rock chickens anterior to the opening of the common bile-ducts; after the third day the worms were distributed over 14 cm. just posterior to the opening. They remained there during their adult lives. Amino-acids in hydrolysates of R. cesticillus and Hymenolepis diminuta were similar, but R. cesticillus contained more free proline and H. diminuta had more free taurine and free amino-acids generally. Transaminases were present in both worms though activity was generally greater in H. diminuta. W. P. Rogers

646—KONDO, T., 1958. [Experimental removal of chicken tapeworm with bithionol.] Journal of the Japanese Veterinary Medical Association, 11 (2), 58-60. [In Japanese.] Bithionol (equivalent of Actamer in U.S.A.) was given to chickens infected with tapeworms believed to be Raillietina tetragona. The dose was 150 to 200 mg, per kg. body-weight and its efficacy was 70%. No side effect on the egg-laying of the hens was noticed.

647-LANDA, D. M., 1959. [Saratovskaya mezhsovkhoznaya vetbaklaboratoriya.] [The application of phenothiazine against ascaridiasis in domestic fowls.] [Abstract.] Veterinariya, 36 (11), 29. [In Russian.]

Phenothiazine was the most effective of several anthelmintics (phenothiazine, sodium fluoride, carbon tetrachloride, tobacco dust) tried against ascaridiasis in domestic fowls. Twenty thousand birds were treated with doses of 0.2 to 0.3 gm. for three to four-month-old chicks and 0.5 to 1.0 gm. for adults, without harmful effects. The treatment was effective, cheap G. I. Pozniak and easy to apply.

648—LITVISHKO, N. T., 1959. [Kharkovski veterinarnii institut.] [Experimental treatment of ducks against *Tetrameres* infection.] [Abstract.] Veterinariya, 36 (11), 29. [In Russian.]

The following were tested against Tetrameres infections in ducks: (i) arecoline hydrobromide in 1:1,000 dilution in doses of 1.5 mg. to 2.0 mg. per kg. body-weight, (ii) purified turpentine in doses of 1 to 1.5 ml. per kg. in various proportions with fish fat, (iii) carbon tetrachloride in doses of 2 ml. per kg. and (iv) phenothiazine in doses of 0.25 gm. per kg. daily for five days, given in food after a 12-hour hunger diet. The first three were intubated orally. Subsequent faecal examinations and autopsy of experimental and control birds showed that carbon tetrachloride was the most effective, phenothiazine less so, turpentine of little value and arecoline hydrobromide totally ineffective.

649—NARAYANA, J. V. & RAO, B. V., 1959. [Andhra Veterinary College, Tirupati, India.] "An unusual location of a capillarid worm in the domestic fowl." Indian Veterinary Journal, 36

Narayana & Rao report a case in which capillarid infection of the laryngeal mucosa with resultant hypertrophy and partial occlusion of the laryngeal lumen was revealed by post-mortem sections. Specific identification of the parasite was not possible, owing to lack of entire material. I. M. Watson

650—NIKITIN, V. F., 1958. [The role played by domestic and wild birds as mechanical carriers of taeniid eggs.] Byulleten Nauchno-Tekhnicheskoi Informatsii Vsesoyuznogo Instituta

Gelmintologii im. Akademika K.I. Skryabina, No. 4, pp. 49–50. [In Russian.] Nikitin, having noticed that domestic and wild birds greedily consume *Taemia* worms and larvae passed in the faeces of treated dogs, was able to demonstrate experimentally that eggs of *T. hydatigena* which have passed through a chicken show no morphological changes. He therefore suggests that birds may serve as mechanical carriers of taeniids of dogs.

G. I. Pozniak

651—POUPLARD, L., 1958. [École de Médecine Vétérinaire de L'État, Cureghem-Bruxelles.] "Les capillaires intestinaux chez la volaille en Belgique." Annales de Médecine Vétérinaire, 102 (2), 89–98.

Pouplard gives a detailed description of Capillaria caudinflata and C. columbae from chickens, as studied by phase contrast microscopy. The author observed fine longitudinal striations, composed of rows of spines on the cuticle of C. caudinflata. These "spiny fields" have not been previously described and are especially well visible on the posterior extremity of the male. The cephalic annular constriction, which Morgan gives as the principal characteristic of Capillaria retusa, cannot be considered as diagnostic of this species since it was found by the author in both C. caudinflata and C. columbae. 40% of the chickens examined were infected with C. caudinflata, 34.58% with C. columbae and 25.42% harboured both parasites. N. Jones

652—REID, W. M., 1959. [Poultry Department and Poultry Disease Research Center, University of Georgia, Athens, Georgia, U.S.A.] "Egg characteristics as aids in species identification and control of chicken tapeworms." Avian Diseases. Ithaca, 3 (2), 188–197.

Reid gives a differential table and a number of photographs whereby the eight common species of tapeworm in poultry can be more readily and more easily identified from the eggs taken from mature segments than by examination of the scoleces.

R. T. Leiper

653—SAWADA, I., 1958. [On an experiment for the removal of the chicken tapeworm, Raillietina kashiwarensis by Actamer. Anthelmintic efficacy when administered by capsule without previous starvation.] Japanese Journal of Parasitology, 7 (4), 388–391. [In Japanese: English summary p. 391.]

300 to 500 mg. per kg. body-weight of Actamer was given to chickens infected with the tapeworm, *Raillietina kashiwarensis*, immediately after feeding, three times successively. Its anthelmintic efficacy was found to be 70%.

Y. Yamao

654—SEMELLINI, L., 1958. [Istituti di Clinica Medica e Malattie Infettive della Facoltà di Medicina Veterinaria della Università di Parma.] "Aspetti ecologici nel trattamento con antielmintici di alcune parassitosi intestinali dei polli." Nuova Veterinaria, 34 (12), 290–295. [English, German & Spanish summaries p. 295.]

Semellini reports on the treatment of 9,884 chickens belonging to 138 different owners. The incidence of infection among the birds was: ascarids 70.94%, Choanotaenia infundibulum and Davainea proglottina (joint incidence) 25%, Capillaria retusa and C. caudinflata (joint incidence) 12.83%, distomiasis 2.7%. The treatment consisted of 2 gm. of Elmifarma (piperazine dithiocarbamate) per kg. of food. Birds thus fed were kept in disinfected chicken houses for 24 hours. In some cases the chicken runs were also disinfected. The treatment was repeated after six to seven days. As a result of the treatment expulsion of parasites was noticed within 12 to 24 hours. General condition of the birds improved within 3 to 30 days, depending chiefly on whether they were kept in enclosures or allowed to roam freely. Clinical signs of infection, however, reappeared four months later when incidence rose to 5–25%, being highest in the case of birds originally completely free. Ascarids were responsible for 85% of the reinfection.

655—SENEVIRATNA, P., 1959. [Department of Veterinary Science, University of Ceylon, Peradeniya, Ceylon.] "Diseases of poultry in Ceylon." Ceylon Veterinary Journal, 7 (1/2), 13–18. Seneviratna mentions inter alia that the most wide-spread helminth in poultry in Ceylon is Ascaridia galli, which is a serious parasite in young birds kept in runs. Syngamus trachea is also wide-spread and common in adults as well as younger birds. Heterakis gallinae is less

common and serious than these two species. Oxyspirura mansoni, Cheilospirura hamulosa and Raillietina spp. are also prevalent but are not pathogenic unless infection is heavy. Hints on treatment and control are given.

J. M. Watson

656—SUPPERER, R., 1959. [Institut für Allgemeine Zoologie und Parasitenkunde der Tierärztlichen Hochschule, Wien.] "Untersuchungen über Parasiten der Hausente, Anas platyrhynchos dom." Zeitschrift für Parasitenkunde, 19 (3), 259–277.

Supperer discusses infections of ducks (Anas platyrhynchos domestica) about two months old with Echinostoma revolutum, E. paraulum, Hymenolepis compressa and Hystrichis tricolor. He claims to have shown that E. revolutum and E. paraulum, believed by authors quoted to be the same species are, in fact, distinct as other authors quoted believe. His reasons are that, whereas E. revolutum uses Lymnaea palustris as its first intermediate host and Planorbis corneus and L. palustris as second intermediate hosts, E. paraulum (the larval development of which Supperer describes) uses P. corneus as the first intermediate host and L. palustris and P. carinatus as second intermediate hosts. The metacercarial cysts of E. paraulum are smaller, measuring 140–156 μ in diameter, with a wall 15 μ thick, whereas those of E. revolutum measure $360-380\,\mu$ and have a wall $40-45\,\mu$ thick. In the metacercariae of E. paraulum no genital organ is visible either with or without staining, whereas in those of E. revolutum the testes and ovary are readily seen. In Russia, Chiaberashvili found metacercariae of E. paraulum in L. ovata. Both species suck villi and mucosa in through the oral sucker, damage the mucosa with their spines and cause enteritis and haemorrhage. The prepatent periods of the two species are about the same. Young ducks fed with snails containing metacercariae of E. paraulum passed eggs in 12 days, the corresponding period for E. revolutum being 11 days. Cercariae of both species overwintering in snails infected ducks fed with them the following spring, but fewer E. revolutum developed from these cercariae. Hymenolepis compressa was also found in the ducks, the domestic duck being a new host for this cestode. Supperer describes and figures its cysticercoid, hitherto not known; he found it, not in the tissues of the snail L. palustris, but in the contents of all three divisions of its stomach, a site not hitherto recorded for a cysticercoid. Ducks fed with infected snails passed cestode segments 12 days later. Ducks reinfected showed some evidence of resistance to further infection (immunity) and in immune ducks the worms showed delayed development; but they can overwinter in the host and become sexually mature the following spring. L. palustris put in an aquarium in October had passed out all their cysticercoids by the end of the following January, but 80% of snails collected in the following April were infected, so that the cysticercoids had overwintered in these snails. The overwintering cysticercoids, however, unlike the overwintering trematode metacercariae mentioned above, showed reduced infectivity, giving origin to few and small cestodes without eggs. Thus ducks hatched in spring and exposed only to overwintering cysticercoids will acquire lighter infections and will have longer to develop immunity than will ducks hatched later in the year. All the ducks examined were infected with Hystrichis tricolor. The females found were much bigger than the size given in the literature. They measured 10-12.5 cm. long, the males measuring 30-35 mm. The egg, a figure of which is given, measures $85-90 \mu$ long by $35-40 \mu$ broad. G. Lapage

657—VALENTE, G. L., 1958. [Istituto Zooprofilattico delle Venezie Zesione della Provincia di Vicenza.] "Segnalazioni di alcuni casi di infestione da trematodi negli allevamenti avicoli rurali." Veterinaria Italiana, 9 (8), 693–698.

Valente describes and illustrates the trematodes which he found in the intestine of guinea-fowl, turkeys and geese in the Province of Vicenza. He concludes that the trematodes from guinea-fowl and turkeys could be identified as *Echinoparyphium recurvatum* and those from geese as *Notocotylus imbricatus*. In the case of guinea-fowl co-infection with *Davainea proglottina* was also found. Single doses of 2 ml. of carbon tetrachloride and paraffin oil were successfully used to arrest mortality among guinea-fowl and turkeys.

N. Jones

Other Birds

See also Nos.: 778, 779, 780, 818, 872, 878, 894, 898, 910.

658—DORNEY, R. S., 1959. [University of Wisconsin, U.S.A.] "Relation of hunting, weather and parasitic disease to Wisconsin ruffed grouse populations." Dissertation Abstracts, 20 (3), 832–833. Dorney found that parasitic disease was related to population density in ruffed grouse in Northern Wisconsin. In particular, infection with Ascaridia bonasae in young ruffed grouse in the summer was directly related to population levels in the latter part of the preceding winter. Parasitic nematodes and cestodes were commonly encountered, the incidence depending upon J. M. Watson the age of the bird and the time of year.

659—GVOZDEV, E. V., 1956. [Parasitic worms of Alectoris graeca Meisner, 1804 in south-eastern Kazakhstan.] Trudi Instituta Zoologii. Akademiya Nauk Kazakhskoi SSR., 5, 61-76. [In

Gyozdev has made a survey of the helminth fauna of Alectoris graeca in south-eastern Kazakhstan and found the following species: Corrigia corrigia, Tamerlania zarudnyi, Postharmostomum gallinum, Brachylaemus fuscatus (trematodes), Davainea proglottina, Raillietina (R.) korkei, R. (R.) graeca, R. (Skrjabinia) circumvallata, Rhabdometra nigropunctata, Tetrathyridium variabile, Dicranotaenia carioca, Hymenolepis sp. (cestodes), Heterakis gallinae, Ganguleterakis altaicus, Subulura brumpti, Ascaridia compar, Cyrnea eurycerca, Cheilospirura gruveli, Tetrameres timopheevoi, Oxyspirura schulzi and an undiagnosed female of the subfamily Aproctinae (nematodes). This brings the number of helminths known for A. graeca from the U.S.S.R. up to 34 species; 13 of the species are reported for the first time for this host. The 34 species are listed, with places of their occurrence in Russia and the relevant authors. [This paper was mentioned by title only in Helm. Abs., 25, No. 865b.] G. I. Pozniak

660—RAYSKI, C., 1959. [University of Edinburgh, Department of Zoology, Edinburgh 9, Scotland.] "On the identity of acanthocephalan parasites of eider duck (Somateria mollissima) in Scotland." International Congress of Zoology (15th), London, July 16–23, 1958. Proceedings, pp. 676–679. [Discussion p. 679.]

Rayski discusses the systematic position of Acanthocephala from eider ducks, traces the history of the species in question and suggests that to revive the genus *Profilicollis* with the species P. botulus (Van Cleave, 1916), P. arcticus (Van Cleave, 1920) and P. major (Lundström, 1942), would avoid future confusion. C. Rayski

Miscellaneous

See also Nos.: 808, 816, 865, 869, 872, 877, 883, 897, 910, 965, 980.

661—BATTE, E. G., 1958. [Veterinary Section, North Carolina State College, School of Agriculture, Raleigh, N.C., U.S.A.] "New developments in the control of large animal parasites." Modern Veterinary Practice, 39 (17), 48–49.

Following various reports of mortality among sheep and cattle due to intestinal helminths in spite of regular phenothiazine drenching, and bearing in mind the sensitivity of sheep to copper sulphate, the North Carolina State College has undertaken a programme of screening of some promising anthelmintic compounds. Another project is the investigation of the biology and control of Stephanurus dentatus in pigs. A method of control, which has shown promise in an infected zone of Georgia, is to keep sows only until the first farrowing and before they have acquired many worms. S. dentatus was experimentally established also in calves. G. I. Pozniak

662-BOKO, F. & GAVEZ, E., 1958. "O nalazima alveolarnog ehinokoka u Bosni." Veterinarski Glasnik, 12 (4), 259–265.

Boko & Gavez report that the incidence of Echinococcus alveolaris infection among the cattle slaughtered in the abattoir of Sarajevo and coming from central Bosnia, was found to be 0.2% -0.3%. In most of the cases the cysts occurred in the liver, although they were also found in the spleen and kidneys. The incidence of this disease was much lower among pigs and it was not discovered at all among sheep. Malignancy and metastasis were not observed by the authors. Pathological and histological findings are described in detail and supplemented with photographs. It is concluded that E. alveolaris infection could also exist among the people in the territory of Bosnia. N. Jones

663—BRUNETTI, O. A., 1959. [Game Management Branch, California Department of Fish and Game, California.] "Occurrence of the giant kidney worm, Dioctophyma renale, in the coyote of California.

California Fish and Game, 45 (4), 351-352.

Brunetti records two instances of coyotes (Canis latrans) being found infected with the giant kidney worm, Dioctophyme renale, in Plumas County, California. In one case four worms, two male and two female, were found occupying a thickened, fibrotic kidney capsule, while in the other case a single worm was found free in the abdominal cavity. The worms ranged in length from 20.5 to 75 cm. Numerous cases of infections of coyote, dog, mink, wolverine and other Canidae and Mustelidae have been recorded in Canada and the U.S.A. The epidemiology of the infection is briefly discussed. J. M. Watson

664—CLARKSON, M. J. & OWEN, L. N., 1959. [Liverpool School of Tropical Medicine, Liverpool, U.K.] "The parasites of domestic animals in the Bahama Islands." Annals of Tropical Medicine and Parasitology, 53 (3), 341-346.

The parasites found during a recent survey in the Bahama Islands in horses, cattle, sheep, goats, pigs, dogs and cats are listed under hosts. The findings are similar to those in other subtropical countries. The most important pathogenic helminths were Oesophagostomum columbianum and trichostrongyles in sheep and goats and Dirofilaria immitis in dogs. 60% of sheep and 52% of goats harboured O. columbianum. No flukes were found in a number of sheep livers examined. G. I. Pozniak

665—DALLING, T., 1959. [Animal Health Branch, Animal Production and Health Division, Food and Agriculture Organization of the United Nations, Rome, Italy.] "The global picture of animal disease." Journal of the American Veterinary Medical Association, 135 (9), 454–457. In an article devoted mainly to bacterial and viral diseases, Dalling makes very brief mention of parasites as hidden causes of lowered animal production. Studies of animal management, anthelmintics and immunity may lead to better control of helminths of the alimentary and respiratory tracts. L. K. Whitten

666—DEMSKI, G., 1958. [Michendorf Bez, Potsdam, Birkenallee 36/38.] "Fragen der planmässigen Bekämpfung parasitärer Invasionen bei Rindern und Schafen durch öffentliche Tiergesundheitsdienste." Monatshefte für Veterinär Medizin, 13 (10), 300–303.

Demski summarizes briefly achievements and problems in the control of helminthiases of

cattle and sheep. He recommends some methods by which better results may be achieved. Prophylaxis is of cardinal importance. N. Jones

667—DISSANAIKE, A. S., 1958. [Department of Parasitology, Faculty of Medicine, University of Ceylon, Colombo.] "On hydatid infection in a Ceylon toque monkey, Macaca sinica." Ceylon Veterinary Journal, 6(3/4), 33-35.

Dissanaike reports the occurrence of three fertile hydatid cysts in the right lobe of the liver of a Ceylon toque monkey, Macaca sinica. He suggests that this monkey acquired its infection in the jungle and stresses the importance of the possible existence of a sylvatic phase of hydatid J. M. Watson disease in Cevlon.

668—DREŽANČIĆ, I., 1958. "O primjeni profilaktičkih mjera pri suzbijanju helmintskih oboljenja." Veterinarski Glasnik, 12 (11), 920-923.

Drežančić gives some advice concerning the prophylaxis of helminthic diseases among domestic animals. Considerable importance is attached to grazing rotation and rational manuring of N. Iones pastures.

669—EHRLICH, I. & WINTERHALTER, M., 1958. [Zavod na biologiju Veterinarskog fakulteta, Zagreb.] "O ulozi terapije kloriranim ugljikovodicima u planskom suzbijanju fascioloze." Veterinarski Glasnik, 12 (4), 266–269. [German summary pp. 268–269.] Ehrlich & Winterhalter found that hexachlorethane, given in therapeutic doses per os, destroyed 97% of Fasciola eggs in cattle and 98% in sheep. Referring to their own previous experiments, the authors explain the relatively low efficacy of hexachlorethane in the treatment of cattle (47%) by reduced resorption of the drug, due to the damaged digestive apparatus, and by the inaccessible position of the flukes in the liver. It was also found that hexachlorethane, unlike

carbon tetrachloride, did not damage the liver. In therapeutic doses it did, however, cause diffuse nephrosis in cattle, which usually disappeared within 7–8 days. Carbon tetrachloride gave 90% cures among sheep. This drug was most effective when administered subcutaneously. The authors recommend: (i) clinical examination of the digestive and uropoietic systems before administering hexachlorethane; (ii) treatment of young animals; (iii) a thorough coprological examination for four to five days after treatment; and (iv) repeating the treatment after three months.

N. Jones

670—K'UNG, F. Y. & YIN, P. Y., 1958. [Peking Agricultural College.] [Notes on some parasitic nematodes obtained from wild animals in the Peking Zoological Garden.] Acta Veterinaria et Zootech-

nica Sinica, 3 (1), 19-28. [In Chinese: English summary p. 24.]

Six known species of nematodes which were collected from animals dying in the Peking Zoo are redescribed and figured. They are *Oesophagostomum aculeatum* from the caecum of a monkey, *Macaca mulatta*, from South China; *Murshidia falcifera* from the colon of an Indian elephant, *Elephas maximus*; *Trichostrongylus colubriformis* from the small intestine of an elk, *Alces alces*, from Siberia; *Ascaris schroederi* from the small intestine and stomach of a giant panda, *Ailuropoda melanoleuca* from China; *Trichuris ovis* from the caecum of a giraffe, *Giraffa camelopardalis*, from Kenya; and *T. ovis* and *T. globulosa* from the caecum of *Alces alces* from Siberia.

L. S. Yeh

671—KUZNETSOV, M. I., 1958. [Incidence of echinococcosis and cysticerciasis in animals slaughtered at Armavir (Northern Caucasus).] Byulleten Nauchno-Tekhnicheskoi Informatsii Vsesoyuznogo Instituta Gelmintologii im. Akademika K.I. Skryabina, No. 4, pp. 47–48. [In Russian.] Of 430 pigs, 1,100 cattle and 1,300 sheep and goats examined at the Armavir slaughterhouse, hydatid was identified in 15, 68 and 215 animals, respectively, and cysticerciasis in two, seven and none. These figures are representative of the average rates of infection occurring in various areas of the Krasnodar and Stavropol Territories.

G. I. Pozniak

672—KUZNETSOV, M. I. & SHULGIN, O. N., 1958. [Prophylaxis of helminth infections of sheep, pigs and ducks under the system of stock maintenance employed at the collective farm 'Rossiya' in the Stavropol Territory.] Byulleten Nauchno-Tekhnicheskoi Informatsii Vsesoyuznogo Instituta Gelmintologii im. Akademika K.I. Skryabina, No. 4, pp. 42–46. [In Russian.]
The maintenance of sheep in pens and fenced pastures with the use of green clover and grazing on ley, as practiced on the collective farm "Rossiya", almost completely protected the animals from infection with Moniezia, Dicroccelium and Protostrongylidae. Dictyocaulus was present only in those flocks which used contaminated water. Similarly, when pigs freed from ascarids were enclosed for the summer and autumn on lucerne pasture, they remained uninfected. Hymenolepis infection was prevented in young ducks when these were separated from old stock and directed to newly constructed water reservoirs.
G. I. Pozniak

673—LAI, M. & PALMAS, G., 1957. [Istituto di Patologia Generale ed Anatomia Patologica Veterinaria della Università di Sassari e Centro di Studio per la Parassitologia Veterinaria del C.N.R.] "I nematodi intestinali dei ruminanti in Sardegna." Atti della Società Italiana delle Scienze

Veterinarie, 11, 589-591. [English & French summaries p. 591.]

Lai & Palmas enumerate the nematodes found in the intestine of 64·2% of 176 cattle, 84·17% of 199 sheep and 87·3% of 126 goats in Sardinia in 1956-57. The nematode species found were: Cooperia oncophora, C. punctata, C. zurnabada, C. curticei, Nematodirus helvetianus, N. spathiger, N. filicollis, N. abnormalis, Trichostrongylus longispicularis, T. colubriformis, T. vitrinus, T. capricola, Bunostomum phlebotomum, B. trigonocephalum, Ostertagia ostertagi, O. circumcincta, Oesophagostomum radiatum, O. venulosum, Chabertia ovina, Trichuris ovis and Strongyloides papillosus.

N. Jones

674—LEINATI, L. & MARAZZA, V., 1959. [Istituto di Anatomia Patologica Veterinaria dell'Università di Milano, Italy.] "La trichinosi negli animali selvatici, in Italia." Clinica Veterinaria. Milan, 82 (1), 1-6. [English summary p. 4.]

Leinati & Marazza conducted an investigation into the prevalence of trichinelliasis in susceptible wild and domestic animals in Italy, using the trichinoscope. They found that 195 (32.8%)

of 594 foxes examined were infected; but 691 animals belonging to other species (dog, cat, rat, mouse, mink, coypu rat, chinchilla, polecat, weasel, pine marten, marmot, squirrel, lion, monkey, chamois, ibex and mole) were not infected. The authors comment on the importance of the common fox in the epidemiology of this infection in the light, not only of their own findings, but also of those of workers in other European countries.

J. M. Watson

675—MEKULI, E. S., 1958. [Veterinarski Institut Priština.] "Prilog poznavanju raširenosti parazitarnih bolesti domaćih životinja na Kosovu i Metohiji." Veterinarski Glasnik, 12 (6), 450-452.

Mekuli writes on the distribution of helminthiases amongst domestic animals in Kosovo and Metokia districts [Yugoslavia]. The most widely spread helminthic diseases are: fascioliasis (60% in sheep); hydatid (30% in cattle and 70% in sheep), and pulmonary and intestinal strongyloses. Cysticerciasis, ascariasis, filariasis and monieziasis are less prevalent. N. Jones

676—MIHAJLOVIĆ, S. & NEVENIĆ, V., 1958. "Problematika najvažnijih invasionih bolesti." Veterinarski Glasnik, 12 (6), 405–409.

Mihajlović & Nevenić discuss some helminthiases from the agricultural point of view. They explain the spreading of the diseases and at the same time propose some prophylactic methods.

N. Jones

677—NANOBASHVILI, V. I., 1959. [The possibility of arsenic being present in produce from domestic animals and birds following treatment with tin arsenate.] Veterinariya, 36 (10), 56–57. [In Russian.] Nanobashvili, while investigating the possibility of arsenic being present in meat, eggs and milk of animals dosed with tin arsenate against helminths, found that lambs given 0·3–0·4 gm. of tin arsenate showed arsenic in the muscles only on the first day after dosing. Only traces of arsenic were found two to five days after treatment, which suggests that after this period meat is fit for human consumption. Hens dosed with 0·15 gm. of tin arsenate showed arsenic in the muscles for three days and after then the meat was free from arsenic. In the muscles of ducks and geese dosed with 0·17–0·2 gm. of tin arsenate, however, traces of arsenic were found on the seventh day, but later the flesh was fit for human consumption. Milk of ewes dosed with 0·7–1·0 gm. of tin arsenate showed the maximum arsenic content during the first three days after treatment, gradually diminishing so that 15–20 days later no arsenic was present. Milk of dosed animals should not be used for food earlier than 20 days after treatment. The author did not find arsenic in the eggs of treated hens, ducks and geese.

C. Rayski

678—NEVENIĆ, V., 1958. "Plan obezbedenja stoke na socijalističkom sektoru od invazionih bolesti." Veterinarski Glasnik, 12 (7), 517–522.

Nevenić reports on a plan for the control of helminthiases, among other parasitic diseases, in domestic animals.

N. Jones

679—NICKEL, E. A., 1958. [Leipzig C.1, Zwickauer Str. 55.] "Die Einrichtung eines Parasitenbekämpfungsdienstes im Veterinäruntersuchungs- und Tiergesundheitsamt." Monatshefte für Veterinär Medizin, 13 (14), 423–425.

Nickel discusses the control of parasitic diseases in domestic animals. He stresses the importance of determining prevalence by post-mortem examination whenever possible, pointing out that results from one coprological examination are not reliable evidence of the non-existence of a parasitic infection.

N. Jones

680—ORTLEPP, R. J., 1959. "The effects on stock of internal worm parasites in modern farming practices in the Union of South Africa." South African Journal of Science, 55 (4), 97–98. Ortlepp outlines the changes in grazing practice in South Africa which have come about since the beginning of the century, and the increased danger from helminths which is attendant on intensive stocking. He recommends that farmers be encouraged to improve their pastures, that no animals are put on pasture before their worm burden has been eliminated as far as possible, that rotational grazing, resting each paddock for at least three weeks, should be introduced, that animals should be examined and treated for worms regularly and that a phenothiazine lick should be provided at intervals.

681—PAPACHRISTOPHILOU, P., 1957. [Services Vétérinaires au Ministère de l'Agriculture.] [L'hydatidose en Grèce chez les ruminants et les porcs.] Bulletin de la Société Vétérinaire Hellénique. Série B, No. 28, pp. 149–165. [In Greek: French summary p. 165.]

Papachristophilou reports on the distribution of hydatid infection in ruminants and pigs in Greece, and presents detailed data on infection percentages according to district, age and species. Levels of infection are related in each area to the percentage of infected dogs. Infection in sheep is particularly high, which is attributed to the close association of dogs and sheep in the country and to a particular sensitivity in this host. Ignorance and lack of hygiene are principal causes for the increasing spread of the parasite. The number of human cases is high. Suggested measures to combat this position are the prevention of infection in the dog by registration, destruction of strays, and the administration of anthelmintics in the course of anti-rabies and other vaccination programmes; public education; the destruction of slaughterhouse waste and the construction of slaughterhouses in every part of the country with the enforcement of effective hygienic measures. [Table B-mentioned in the text-E. Bennett is missing.]

682—PETROVIĆ, K., 1957. [Veterinarski Institut N.R.S.] "Prilog upoznavanju i suzbijanju invasionih bolesti u NRS od 1953 do 1956 godine." Veterinarski Glasnik, 11 (12), 1161-1167. Petrović gives a brief account of the work done by the Yugoslavian State Veterinary Institute concerning the control of infectious diseases (including helminthiases) among domestic animals in Yugoslavia from 1953 to 1956.

683—POZDNYAKOVA, K. M., 1959. [Kafedra veterinarno-sanitarnoi expertizi Omskogo veterinarnogo instituta.] [The incidence of trichinelliasis among rodents and carnivores in Omsk and in some districts of the Omsk region.] Meditsinskaya Parazitologiya i Parazitarnie Bolezni. Moscow,

28 (2), 214–216. [In Russian: English summary p. 216.] Pozdnyakova reports that in the Omsk region *Trichinella* infection was found in 1.06% of 473 barn rats, 8.9% of 101 red foxes, 11.1% of steppe foxes (korsaks), 1.62% of 61 dogs and in one hedgehog examined. Autopsy of 72 silver foxes, nine mink, one ermine and five cats revealed no trichinellae. The larvae were mostly found in the diaphragm muscles and in the serratus magnus posterior, inferior and superior in barn rats and foxes, while in dogs they were mainly found in the lower part of the diaphragm. The shape of Trichinella cysts was lemon-like in rodents and dogs and spherical in foxes. N. Jones

684—RAUCHBACH, K., 1958. [VEB Schlachthof Arad (Rumania).] "Betrachtungen zur Echinokokkenkrankheit der Schlachttiere." **Monatshefte für Veterinär Medizin, 13** (11), 340–343. Rauchbach compares the incidence of hydatid revealed during meat inspection in the Arad (Rumania) abattoir from 1953 to 1956 inclusive. In 1953 hydatid was found in 32.75% of cattle, in 19.33% of sheep and 14.14% of pigs. The corresponding figures in 1956 were 38·36%, 52·69% and 8·11%. All of 26 cattle examined had hydatid of the lungs and liver. In one of these fascioliasis was found. In nine cases the spleen, in four the heart muscle, in three the pleurae and in one case the humerus were affected by hydatid. All animals were lean but had shown no clinical symptoms. The average slaughter output of these animals was 38% as compared with 47-50% in the case of healthy animals. To reduce the incidence of hydatidosis the author recommends the destruction of infected organs and reduction in the number of dogs. N. Jones

685-RAUSCH, R. A., 1959. "Notes on prevalence of hydatid disease in Alaskan moose." Journal of Wildlife Management, 23, 122-123.

Rausch examined 124 pairs of moose lungs in two isolated moose populations in south-central Alaska. Cysts of Echinococcus granulosus were found in 24 of 101 animals north of the Knik Arm of Cook Inlet; while south of this natural barrier only one of 23 animals was infected. A direct relationship was found between the age of the host and prevalence of cysts. The presence of cysts had no apparent adverse effects on the general physical condition of the host.

G. A. Webster

686—ROVEDA, R. J., NIEC, R. & RIZZO, H. R., 1959. [Técnicos de la Secretaría de Estado de Agricultura y Ganadería de la Nación, Argentina.] "El fluoruro de sodio como antihelmíntico en cerdos y caballos." Revista de Investigaciones Ganaderas. Buenos Aires, No. 5, pp. 27-34. [English

summary p. 33.1

Sodium fluoride was given to pigs as 1% of the semi-dry ration; water must be avoided as a toxic effect is produced. The drug was given to horses in the form of an electuary in strengths varying from 0.1 to 0.3 gm. per kg. body-weight. In the pigs, Ascaris lumbricoides were eliminated and from 30-40% of Arduenna strongylina and Physocephalus sexalatus, while in horses the drug was effective against Parascaris equorum and anoplocephalids. W. K. Dunscombe

687—ŠIBALIĆ, S., 1958. "O srestvima koja se koriste u suzbijanju invasionih bolesti i zadaci u vezi sa tim." Veterinarski Glasnik, 12 (7), 523-524.

Sibalić discusses the problems of control of parasitic diseases in domestic animals. It is suggested that most of the existing anthelmintics have some drawbacks such as toxicity and difficulty in administration. Improved methods for the use of drugs are suggested.

688-TOMAŠEVIĆ, T., 1958. "Prilog upoznavanju ehinokokoze kod domaćih životinja u NR Crnoj Gori." Veterinarski Glasnik, 12 (3), 168-173.

Tomašević reports that the average incidence of hydatid among the animals slaughtered in Montenegro in the summer and autumn of 1957 was 30% of 9,214 cattle and 18.9% of 28,270 sheep. This incidence was higher in the southern and south-western parts of the Republic than in the northern part. N. Jones

689—TAVŽELJ, J. & SNOJ, J., 1958. "Statistički i veterinarski podaci o radu na Ljubljanskoj klaonici u razdoblju od 1.I.1952 do 31.XII.1956. Veterinarski Glasnik, 12 (9), 716–719. [German summary p. 719.]

Tayželj & Snoj report on the incidence of helminthiases among animals slaughtered at the Ljubljana (Yugoslavia) abattoir from 1952 to 1956 inclusive. The total numbers of animals slaughtered were: cattle, 55,754; calves, 56,177; pigs, 131,473; equines, 5,890; and sheep 14,769. The incidence of cysticerciasis was 0.77% in cattle and 0.06% in pigs. Hydatid was found in 4.83% of cattle, 3% of sheep and 17.11% of pigs. Trichinelliasis was found in only one animal, a pig.

690-VITALE, G., 1957. [Istituto di Ispezione degli Alimenti di origine animale della Università di Messina.] "Osservazioni sulla fertilità delle cisti da echinococco negli animali da macello." Atti della Società Italiana delle Scienze Veterinarie, 11, 708-709. [English & French summaries

Vitale reports on the incidence of fertile hydatid cysts from 257 cattle, 74 pigs, three sheep, two goats and one donkey, slaughtered at the Messina abattoir. The incidence was: 8.1% in cattle under two years old, 15.45% in those over two years old, 25.67% in pigs and 66.66% in sheep. One of the two goats and the donkey also had fertile cysts.

691—WILLMOTT, S., 1959. [103 St. Peter's Street, St. Albans, Herts, U.K.] "Hydatid cysts in offal." [Correspondence.] Veterinary Record, 71 (43), 917.

Willmott urges the desirability of introducing legislation in the United Kingdom to prevent the sale of hydatid-infected offal by pet stores unless previously sterilized by thorough cooking. At present, although hydatidosis is not a rare disease in Britain and is responsible for a number of deaths annually, there is no control either over the sale of infected offal from slaughterhouses or knackeries to pet shops or over its subsequent resale. I. M. Watson

692—ŻARNOWSKI, E., 1959. [Wyższa Szkoła Rolnicza, Lublin, Poland.] "Przegląd dorobku polskiej parazytologii weterynaryjnej za ostatnie dwulecie (1956-1958)." Wiadomości Parazytologiczne,

5 (2/3), 117-139. [English summary pp. 134-139.]

In this review of work done in veterinary parasitology during the past two years in Poland, 80 of the more important papers are taken into consideration. Fascioliasis and lungworms in ruminants, being of great importance, have received special attention in recent years. G. I. Pozniak

FISHERIES HELMINTHOLOGY

Fresh-Water Fisheries

See also Nos.: 771, 772, 775, 783, 784, 817, 832, 852, 853, 854, 928, 954.

693—AGAPOVA, A. I., 1956. [Parasites of fish in water reservoirs of western Kazakhstan.] Trudi Instituta Zoologii. Akademiya Nauk Kazakhskoi SSR., 5, 5-60. [In Russian.]

Thirty-six species of fish, caught in the river Ural, Lake Chelkar and the Kamish-Samara Lakes, were examined for parasites. The parasite fauna of the Ural is studied for the first time. The parasites found included 52 species of trematodes, 8 of cestodes, 11 of nematodes, 2 of acanthocephalans and 2 of leeches. Eighteen helminth and one leech species are marked as new for Kazakhstan. These are: Bucephalus markevitschi, Opisthorchis felineus, Bunodera lucioperca, Phyllodistomum pseudofolium, Paratormopsolus siluri, Dactylogyrus auriculatus, D. chondrostomi, D. chranilowi, D. cornu, D. formosus, D. fraternus, D. solidus, D. minor, Gyrodactylus parvicopula, Mazocraes alosae, Anisakis sp., Cucullanus sphaerocephalus, Leptorhynchoides plagicephalus and Cystobranchus fasciatus. Notes on hosts, and on rates and intensities of infection are given for each parasite, and the fauna is also discussed under individual hosts. [This paper was mentioned by title only in Helm. Abs., 25, No. 865a.]

G. I. Pozniak

694—PODLESNOV, A. V., 1959. [Terapevticheskoe otdelenie Vostochno-Kazakhstanskoi bolnitsi.] [Infestation of fishes with metacercariae of *Opisthorchis felineus* in Lake Zaysan and the upper reaches of the Irtysh River.] [Abstract.] Meditsinskaya Parazitologiya i Parazitarnie Bolezni. Moscow, 28 (2), 235–236. [In Russian.]

Podlesnov, after having found opisthorchiasis in 15.55% of 90 patients, in 40% of 10 cats and in four out of six dogs examined, examined some fish for metacercariae. In Lake Zaysan and the upper reaches of the Irtysh River metacercariae of *Opisthorchis felineus* were found in 55% of ide, 49% of *Leuciscus* sp., 45% of roach, 41% of tench and 7% of carp; the total number of these fish examined was 846. No metacercariae were found in 91 other fish.

N. Jones

Marine Fisheries

See also Nos.: 771, 777, 910, 912, 953.

695—GETSEVICHYUTE, S. Y., 1958. [Parasite fauna of fish in the Kurskiy Zaliv.] Biologijos Instituto Darbai. Vilnyus, 3, 101–139. [In Russian: Lithuanian summary p. 137.]
129 parasite species were found on examination of 424 fish from the lagoon, Kurskiy Zaliv (Kurisches Haff), and these included 23 species of Monogenea, 25 of Digenea, 16 of Cestoda, 10 of Nematoda, four of Acanthocephala and two of Hirudinea. Notes stating hosts and infection rates are given for each parasite. The species are also listed under hosts and the parasite fauna is discussed from various aspects such as its distribution and its relation to the host diet.

G. I. Pozniak

696—ONO, H., 1958. [Department of Public Health, Faculty of Medicine, Kyushu University, Fukuoka, Japan.] [The fate of *Ascaris* eggs experimentally fed to shore fish and shellfish.] **Igaku Kenkyu.** Fukuoka, 28 (11), 4463–4470. [In Japanese: English summary p. 4470.]

Seven species of marine fish, which had been kept in a crawl, were fed with immature and mature ascarid eggs. Immature eggs were excreted without apparent damage and retained the ability to develop normally. Mature eggs sometimes hatched in the intestine of the fish and larvae were found moving vigorously in the faeces. But even in the case of hatched larvae, intra-hostal migration seemed unlikely. Out of 105 fishes consisting of 15 species, all purchased at fish markets, seven were found to have ascarid eggs in their intestines; but in 81 oysters examined, no ascarid eggs were found, although an egg of *Trichuris trichiura* was detected. In 100 sea muscles (*Mytilus crasitesta*) no ascarid eggs were found. These facts suggest that shore fish and oysters might be contaminated with human excreta in their natural environment.

Y. Yamao

697—ORLANDINI, C., 1957. [Osservatorio ittiopatologico dell'Istituto di Anatomia Patologica Veterinaria della Università di Milano.] "Metacercariosi in Mullus barbatus (L.) e Mullus surmuletus (L.) del Mediterraneo." Atti della Società Italiana delle Scienze Veterinarie, 11, 646-649.

English & French summaries p. 649.]

Orlandini reports on the recovery of metacercariae, probably belonging to the Echinostomidae, from Mullus barbatus and M. surmuletus caught in the central Mediterranean and sold in Ascoli Piceno (Italy). The paper is supplemented with two photomicrographs of the metacercaria and a photograph of the host. N. Iones

Miscellaneous

See No. 800.

NEMATOLOGY

Free-Living Nematoda

See also Nos.: 723, 739, 787, 788, 789, 790, 791, 794, 798, 804, 805, 807, 810, 812, 813, 814, 867, 909.

698—SALISBURY, P. J. & BOSHER, J. E., 1959. "Nematodes." Canadian Insect Pest Review, 37 (2), 134-135.

Salisbury & Bosher report on the findings of a survey in 1958 for soil nematodes in forest nurseries at four named locations and in the West Kootenay forest region. Xiphinema sp. occurred in small numbers in two samples from the nurseries. Nine non-parasitic genera were also represented. Small populations of Criconemoides sp. were found in over half of the samples from the West Kootenay region and twelve non-parasitic genera were encountered. D. I. Hooper

699—WIESER, W., 1959. "The effect of grain size on the distribution of small invertebrates inhabiting the beaches of Puget Sound." Limnology and Oceanography, 4 (2), 181–194.

The intertidal distribution of small invertebrates of marine beaches of five localities in Puget Sound, Oregon, U.S.A., is reported (turbellarians excluded). The five localities represent a series of decreasing exposure and decreasing size of substrate. Figures are given to show the distribution of each invertebrate group in relation to grain size of substrate and intertidal height. Wieser suggests that distribution of many common invertebrate species is determined more by the nature of the substrate than by the levels of tidal water. A critical grain size of 200 \(\mu\) median diameter is established as an important distribution barrier between the bulk of interstitial dwellers and burrowing animals. Nematodes are excluded from this limitation of critical grain size. Wieser shows the relation of locomotor types to the critical grain size barrier. interstitial "sliders" being found above the 200 \(\mu\)-line and burrowers below it. R. W. Timm

700—WIESER, W., 1959. "A note on subterranean nematodes from Chesapeake Bay, Md." Limnology and Oceanography, 4 (2), 225-227.

A small scale investigation was made at two points on Chesapeake Beach, Maryland, U.S.A., of the nematode fauna of the subterranean water. The 23 species found are placed in various ecological and geographical groups. R. W. Timm

Plant-Parasitic Nematoda

See also Nos. 798, 810, 863, 866, 867, 874, 875, 907, 925, 940, 941, 943; Nematology-Control.

701-ANON., 1958. "New nematode-resistant lima bean." Agricultural Research. Washington, **6** (10), 5.

This is a popular article describing how, as a result of 15 years of breeding work, a lima bean, Nemagreen, has been developed which is resistant to root-knot nematodes. The resistant parent was selected by the Hopi Indians for adaptability to their infested soils in Arizona.

From this was developed Oklahoma 27 which was crossed with Early Thorogreen. One back-cross to Early Thorogreen was made to improve yield and quality, and finally the resistant Nemagreen was developed and put on the market.

M. T. Franklin

702—ANON., 1959. "Diseases of lucerne." Agricultural Gazette of New South Wales, 70 (8),

This article includes an account of stem nematode [Ditylenchus dipsaci] in lucerne and describes and illustrates the symptoms of the disease and the way it is spread. Control measures recommended include the cutting, drying and then burning of infected crops; cultivation and cleaning of the land and the growing of non-host crops for three to four years. Seed from infected crops should be treated in warm water for 15 minutes at 118–120°F, then quickly and thoroughly dried and sown within a few days of treatment.

D. J. Hooper

703—ANON., 1959. "Nematode spreads a plant virus." Agricultural Research. Washington, 7 (7), 14.

This is a very brief note drawing attention to the work of Hewitt, W. B., Raski, D. J. & Goheen, A. C. [for abstract see Helm. Abs., 27, No. 286f]. [Omission of the reference to the original paper in this note is an unfortunate oversight.]

M. T. Franklin

704—ANON., 1959. "Alfalfa stem nematode (Ditylenchus dipsaci)." Canadian Insect Pest Review, 37 (2), 127.

Ditylenchus dipsaci has reappeared on lucerne on plots at Lethbridge where it was first noticed in 1950.

D. J. Hooper

705—ANON., 1959. "Import interceptions." Canadian Insect Pest Review, 37 (2), 144-145.

Import interceptions included: Meloidogyne incognita var. acrita on Sansevieria; M. incognita, M. arenaria and M. hapla on rose plants from the U.S.A.; M. arenaria on roses from Belgium and Holland and on Sorbus from Holland; M. hapla on Berberis from Tennessee and roses from Holland; M. incognita on Ligustrum from Iowa; Heterodera rostochiensis cysts in soil with shamrock from Ireland; and various named nematodes associated with Malus understock from Germany.

D. J. Hooper

706—ANON., 1959. "Border interceptions." Canadian Insect Pest Review, 37 (3), 169.

In a shipment of strawberry plants from Indiana, intercepted at London, Ontario, 30% of the plants were infected with *Meloidogyne hapla*. A heavy infection of *M. arenaria* was intercepted on a tomato plant shipment from Georgia. *M. incognita*, *M. incognita* var. *acrita* and *M. javanica* were also encountered in some shipments.

D. J. Hooper

707—ANON., 1959. "Border interceptions." Canadian Insect Pest Review, 37 (5), 210. Sansevieria plants from Florida infected with Meloidogyne arenaria and M. hapla and Neanthe Belle "baby" palms, Collinia elegans, from Hawaii infected with M. incognita were intercepted on entry into Canada.

D. J. Hooper

708—ANON., 1959. "A stem nematode on alfalfa (Ditylenchus dipsaci (Kuhn, 1857) Filipjev, 1936)." Canadian Insect Pest Review, 37 (6), 215–216.

In some patches of lucerne on experimental plots at Lethbridge at least 50% of the plants were infected with *Ditylenchus dipsaci*. The nematodes survived the 1958–59 winter and observations will be made on survival of plant and parasite during the next winter. D. J. Hooper

709—BARKER, K. R. & SASSER, J. N., 1959. [Department of Plant Pathology, North Carolina Agricultural Experiment Station, Raleigh, North Carolina, U.S.A.] "Biology and control of the stem nematode, Ditylenchus dipsaci." Phytopathology, 49 (10), 664-670.

Ditylenchus dipsaci extracted from infected plants was used for inoculation of seeds of test plants immediately before sowing in steam disinfected soil. A high level of soil moisture was maintained. Seedlings were examined two to three or five to six weeks after planting and classified as highly resistant, i.e. garlic, oats, carrot, tall fescue, barley, hyacinth, narcissus,

daffodil, flue-cured tobacco, twitch (*Poa pratensis*), chickweed, and maize; resistant, i.e. onion, peanut, mouse-ear, chickweed, teasel, potato, dandelion, crimson clover and white clover; slightly susceptible, i.e. iris, tomato, lucerne, tobacco (burley), Austrian winter pea, rye, and red clover; susceptible, i.e. soya bean, lucerne, bean and garden pea. New records for North Carolina as weed hosts were established for buttercup, speedwell, neckweed, dead nettle, false daisy, chickweed, dandelion and garlic. These host range studies may assist with the planning of crop rotation programmes and weed control. Application of 0, 0-diethyl-0-2 pyrazinyl phosphorothioate, at 4 lb. per acre at sowing or 16 lb. per acre one week after sowing, gave complete control of *Ditylenchus dipsaci*, whilst Nemagon was considerably less effective.

710—BLAKE, C. D. & CONROY, R. J., 1959. [Department of Agriculture, Sydney, New South Wales, Australia.] "Some nematodes as factors in yield reduction and spawn degeneration in the cultivated mushroom Agaricus hortensis (Cke.) Imai." Journal of the Australian Institute of Agricultural Science, 25 (3), 213–216.

Blake & Conroy examined outdoor mushroom ridge beds for nematodes and found that a high nematode population (more than 5,000 per 100 gm. moist compost) was associated with a low yield of mushrooms and conversely a low count (less than 500) was associated with good mycelium growth. Nematodes extracted from compost included *Ditylenchus myceliophagus*, *Rhabditis* spp. (mainly *R. terricola*), *Aphelenchoides* sp., *Diplogaster* sp. and *Rhabditella* sp. When *D. myceliophagus* and *Rhabditis* sp. were introduced to rye grain mushroom cultures the former caused degeneration of the spawn but remained relatively free from bacterial contamination; with the latter there was a marked development of bacteria together with a viscous matrix bounding the degenerating mycelium. In these cultures the *D. myceliophagus* population showed little increase but the *Rhabditis* population had an increase of up to 180-fold. The source of nematode infection in mushroom beds appears to come mainly from the compost. In the absence of peak heating facilities, fumigation of the compost with methyl bromide (1 lb. per 100 cu. ft. of compost) is suggested.

D. J. Hooper

711—BROWN, E. B., 1958. "Observations on a race of *Ditylenchus dipsaci* attacking annual aster and sweet sultan." Plant Pathology. London, 7 (4), 150–151.

Brown describes and illustrates with photographs an attack of Ditylenchus dipsaci on annual asters (Callistephus chinensis Nees) and sweet sultan (Centaurea moschata L.) in the field. Infected aster plants were stunted with swollen and distorted stems and petioles containing many D. dipsaci. Attacked sweet sultan plants had swollen and twisted flower stems containing many D. dipsaci which were also present in the receptacles and among developing ovules. A pyrethrum plant was also found infected with D. dipsaci and Aphelenchoides ritzema-bosi. In a host trial carried out on the infested land oats, sugar-beet, onions, asters, Vicia faba L. and Phlox drummondii Hook. showed stem eelworm damage. The weeds Sonchus arvensis L., Lychnis alba Mill. and Aethusa cynapium L. were also found infected with stem eelworm.

712—BROWN, E. B., 1959. "A broad red clover resistant to stem eelworm." Plant Pathology. London, 8 (4), 124.

A stock of broad red clover seed sown in the field in 1955 showed considerable resistance to stem eelworm (*Ditylenchus dipsaci*) compared with another stock of red clover seed, sown on the same field, which was severely attacked. Pot tests with seed harvested from the resistant stock have also shown that this clover has a remarkable degree of stem eelworm resistance.

D. J. Hooper

713—BROWN, E. B., 1959. "New or uncommon plant diseases and pests. Eelworms on strawberries." Plant Pathology. London, 8 (4), 152.

Brown records Aphelenchoides ritzema-bosi as an endoparasite of strawberry both under glass and in the field. There were numerous eelworms in dark green or dark brown blotches, delimited by veins, scattered over yellowing leaves. He also found crinkled strawberry leaves infected by Ditylenchus dipsaci in small numbers, without eggs. It is suggested that they belong to a race for which strawberry is a poor host.

M. T. Franklin

714—BROWN, E. B., 1959. "New or uncommon plant diseases and pests. New host plants of Aphelenchoides ritzema-bosi." Plant Pathology. London, 8 (4), 152.

Aphelenchoides ritzema-bosi has been found causing typical inter-veinal necrosis in Peperomia griseo-argentea, P. caperata (both new host records) and P. glabella.

M. T. Franklin

715—EDGERTON, L. J. & PARKER, K. G., 1958. [Cornell University, Ithaca, New York.] "Effect of nematode infestation and rootstock on cold hardiness of Montmorency cherry trees." Proceedings of the American Society of Horticultural Science, 72, 134-138.

Young trees of Montmorency cherry growing in soils with a high population of *Pratylenchus penetrans* are less winter hardy than similar trees established in sites treated prior to planting with a nematicide. The authors suggests that this effect is due to the small feeder roots becoming invaded, with the result that the trees cannot absorb adequate water and nutrients and their metabolic processes are reduced. Because of this they do not harden sufficiently. Under the conditions of these tests, plants grown on Mahaleb stocks were more winter hardy than those on Mazzard stocks.

A. M. Shepherd

716—ENDO, B. Y., 1959. [Crops Research Division, U.S.D.A., Jackson, Tennessee, U.S.A.] "Responses of root-lesion nematodes, *Pratylenchus brachyurus* and *P. zeae*, to various plants and soil types." Phytopathology, 49 (7), 417–421.

In host-range studies in pots, *Pratylenchus zeae* multiplied best on cereals, grasses and soya bean, whereas most other plants tested, including several legumes, were poor or non-hosts. *P. brachyurus*, on the other hand, multiplied better on legumes than on Gramineae generally, although maize (*Zea mays*) and Sudan grass ranked with tobacco, cotton and crimson clover as the most efficient hosts among the plants tested. Lettuce, which was the least favourable of the 30 crops tested against *P. brachyurus*, apparently was not a host of *P. zeae*. Norfolk sandy loam favoured population increase of *P. brachyurus* much better than did Cecil clay-loam with Portsmouth loam intermediate. The same was true for horizontal migration of *P. zeae* in the presence of plant roots, whereas there was little or no migration of this nematode in the absence of roots.

R. D. Winslow

717—FAULKNER, L. R., 1959. [University of Wisconsin, U.S.A.] "Pathological histology, hosts and culture of the potato rot nematode." Dissertation Abstracts, 20 (3), 838.

Faulkner isolated washed female *Ditylenchus destructor* in petri dishes containing acidified dextrose potato agar and a fungus host. Nematodes from the pure colonies so obtained reproduced in large numbers on cultures of *Torula* sp., potato, clover, carrot and tobacco, callus tissues growing *in vitro*. Four years of continuous culture produced no apparent decrease in pathogenicity to potatoes. *D. destructor* fed and reproduced on 64 species of fungi (representing 40 genera, eight orders and all major classes) out of 115 tested. Inoculation of culture nematodes into potted potato plants showed that symptom expression was most severe when pots were inoculated with fungi in addition. Histopathological studies indicated that although the nematode alone can seriously damage potato tissues, the presence of secondary invaders, primarily fungi, is necessary for advanced disease development. Clover, lucerne parsnip, radish, sweet-potato and bulbous iris were also found susceptible to attack by *D. destructor*.

J. M. Watson

718—GOFFART, H., 1958. "Unterschätzen wir die Alchengefahr?". Mitteilungen der Deutschen Landwirtschafts-Gesellschaft, 73 (13), 327-329.

In this semi-popular article, Goffart draws attention to the importance of plant nematodes in many crops in Germany. He mentions in particular Heterodera avenae (=major) in cereals, H. schachtii in root crops, H. trifolii in clovers, and D. dipsaci and Pratylenchus spp. (including penetrans) in various crops. In addition to direct damage by their own feeding habits, nematodes may facilitate entry of other pathogens. Peas, grapes and other fruits, and tree nurseries are mentioned as other crops which may be damaged by nematodes.

R. D. Winslow

719—GOSS, O. M., 1958. "List of plant parasitic eelworms recorded in Western Australia." Journal of Agriculture of Western Australia, 3rd series, 7 (3), 317.

Goss lists 19 nematode species representing 12 genera of nematodes which have been found attacking or in association with various named plants in Western Australia. The year of first identification for each nematode species in Western Australia is given. D. J. Hooper

720—HARRISON, B. D. & CADMAN, C. H., 1959. [Rothamsted Experimental Station, Harpenden, Herts, U.K.] "Role of a dagger nematode (Xiphinema sp.) in outbreaks of plant diseases caused by arabis mosaic virus." Nature. London, 184, (4699), 1624–1626.

Harrison & Cadman present good evidence that Xiphinema sp. is a vector of the raspberry yellow dwarf strain of the soil-borne virus, arabis mosaic [see also abstract No. 721 below]. The nematodes were invariably present in virus patches in raspberry, strawberry and white clover crops, the soil types involved ranging from light shingle in Hampshire to heavy loam in Pembrokeshire and black fen in Norfolk. Hand-picked nematodes from virus-infected soil transmitted the disease to healthy pea seedlings. The infectivity of the soil was destroyed by treatment with chemicals which apparently kill the Xiphinema but have little or no effect on the virus in vitro. R. D. Winslow

721--JHA, A. & POSNETTE, A. F., 1959. [East Malling Research Station, Kent, U.K.] "Transmission of a virus to strawberry plants by a nematode (Xiphinema sp.)." Nature. London, 184 (4691), 962-963.

Jha & Posnette found a species of Xiphinema associated with the incidence of raspberry yellow dwarf in strawberries. In pot experiments, transmission of this soil-borne virus occurred when hand-picked nematodes were added to heat-treated soil, but not in their absence,

 722—KASIMOVA, G. A., 1958. [The occurrence of root-knot nematode in Astara.] Dokladi Akademii Nauk Azerbaidzhanskoi SSR., 14 (6), 471-473. [In Russian.]
 An investigation in Azerbaijan in 1956 showed Meloidogyne to be present on two farming sections in Astara. The eelworms were present on cucumbers, tomatoes, aubergines, pumpkins and various green vegetables. Kasimova suggests preventive measures and treatment for their G. I. Pozniak control.

723—KRALL, E., 1958. [Zoologia ja Botaanika Institut Eesti NSV Teaduste Akadeemia, Estonia.] "Kartuli fütonematoodidest Eestis mugulate talvise säilitamise perioodil." Izvestiya Akademii Nauk Estonskoi SSR. Seriya Biologicheskaya, No. 3, pp. 187–193. [German & Russian sum-

maries pp. 192-193.]

In Estonia, potato tubers are affected during winter storage by Ditylenchus destructor (about 6% to 7% were infested in some cases). Another species causing rot is Neotylenchus abulbosus. Tubers so infested are then attacked by saprobiotic nematodes, of which Diplogaster Iheritieri is the most important, and the author was able to observe the transition stages between the two types of infection. Of typical saprobionts various representatives of Rhabditis, Diplogaster and Cheilobus are typical for rotting tubers, e.g. R. brevispina, R. teres, R. aspera, R. pseudoxycerca, R. curvicauda, D. lheritieri, D. superbus and others. In this group is also included the atypical saprobiont Panagrolaimus rigidus. G. I. Pozniak

724—KRUSBERG, L. R., 1959. [N. C. State College, Raleigh, North Carolina, U.S.A.] "Investigations on the life cycle, reproduction, feeding habits and host range of Tylenchorhynchus claytoni Steiner."

Nematologica, 4 (3), 187-197. [German summary p. 196.]

Tylenchorynchus claytoni, studied on nutrient agar on which were grown lucerne seedlings, laid eggs close to the lucerne roots (especially root caps and feeding hairs). These hatched in about six days and the life-cycle was completed in about one month. Sexual reproduction was established. Feeding on the epidermal cells of the root cap and amongst root hairs was observed, but not actually on the root hairs. The nematode glided over the root surface in search of a feeding area, and after puncture of the epidermis by the stylet, feeding continued in the same spot for about half-an-hour. No injury to root cells was recorded but the root system was considerably reduced by heavy infections. T. claytoni reproduced at temperatures optimum to the growth of host plants. On tobacco the highest numbers were recovered at 85–95°F. and on wheat at 70–80°F. No reproduction occurred between 35–55°F. Survival studies in moist soil devoid of plants into which were placed 200 nematodes, gave a decrease of 4·2 nematodes per month, and of 3·5 for every increase of 5°F. commencing from 35°F. The nematode lived in the absence of host plants in moist soil for ten months at temperatures of 35–75°F. Host range studies led to classification of plants according to nematode incidence into highly favourable, favourable and unfavourable for nematode reproduction. The most favourable hosts were tobacco, maize, sudan grass, wheat, oats, barley, rye, gram, potato, sweet potato, milo and several legumes. Favourable hosts were soya bean, lucerne, lespedeza, clovers, cotton, tomato and millet. Unfavourable hosts were pepper, cucumber, peanut and showy crotalaria. Plant growth was, however, not related to nematode populations as top weights of heavily infected plants were frequently heavier than those from nematode-free plants.

H. Jacks

725—KÜHN, H., 1959. [Institut für allgemeine Botanik der Friedrich-Schiller-Universität, Jena, Germany.] "Zum Problem der Wirtsfindung phytopathogener Nematoden." Nematologica, 4 (3), 165–171. [English summary p. 170.]

Observations were made on the movement of larvae of the potato-root eelworm, *Heterodera rostochiensis*, in filter paper strips contained in petri dishes. A potato root was placed at one end of the paper strip. Kühn recorded the number of larvae which collected at the root side after a certain time. From these results he concludes that the larvae move at random. He argues that diffusion gradients of an attractant substance are very unlikely to occur and he suggests that larvae meet roots by chance and accumulate there under the response of some chemical secreted by the root into the rhizosphere. Furthermore he suggests that plants and their diffusates do not directly attract nematodes chemotropically but solely influence the rate of movement of larvae.

H. R. Wallace

726—LOEWENBERG, J. R., SULLIVAN, T. & SCHUSTER, M. L., 1959. [University of Nebraska, Lincoln, Nebraska, U.S.A.] "A virus disease of Meloidogyne incognita incognita, the southern root knot nematode." [Correspondence.] Nature. London, 184 (4702), 1896.

Diseased larvae of *Meloidogyne incognita*, found during experimental work, were very sluggish and did not give rise to galls on the roots of tomatoes. The disease was transmitted by the addition of diseased larvae to healthy surface-sterilized eggs. Tests failed to show the presence of bacteria or visible micro-organisms. The infectious agent passed through a Seitz filter, indicating that it is a virus.

M. T. Franklin

727—MAUNG, O., 1959. "Effects of Meloidogyne incognita acrita and Trichodorus christiei on the nutrient levels of tomato." [Abstract of paper presented at the 16th Annual Meeting of the Potomac Division, American Phytopathological Society, Beltsville, Md, February 26–27, 1959.] Phytopathology, 49 (8), 524.

Analysis of tomato plants heavily parasitized by the root-knot nematode, *Meloidogyne incognita* var. *acrita*, showed significantly decreased sodium content and increased nitrogen, phosphorus and potassium levels. Tomatoes heavily infected by the ectoparasitic *Trichodorus christiei* tended to be deficient in all nutrients. Sugar content was not affected by either nematode.

R. D. Winslow

728—MISHRA, U. S. & CHAUTHANI, A. R., 1959. [M. B. College of Agriculture, Gwalior, India.] "Spotlight on eelworms." Indian Farming, 9 (6), 33, 35-39.

This general article on plant-parasitic nematodes touches on Anguina, Aphelenchoides, Heterodera and Meloidogyne, describing the life-histories, the symptoms of attack in the plants and means of control. Species so far recorded in India are Anguina tritici, Ditylenchus angustus, Radopholus similis, Meloidogyne incognita acrita, M. incognita and M. javanica.

M. T. Franklin

729—MULVEY, R. H., 1959. [Nematology Section, Entomology Research Institute, Canada Department of Agriculture, Ottawa.] "Giant eggs of the clover cyst nematode, Heterodera trifolii Goffart, 1932." [Correspondence.] Nature. London, 184 (4699), 1662–1663.

This is a report on the activity of the sperm of the sugar-beet nematode Heterodera schachtii in the reproductive tract of the clover cyst nematode Heterodera trifolii. The sperm penetrates the oocytes but union of sperm and egg nuclei was not observed. Impregnated females of H. trifolii were cultured on white Dutch clover, and the second generation females produced giant and normal eggs. Giant eggs averaged 178 $\mu \times 45 \mu$. Two meiotic spindles were observed in one giant egg and another contained a large spindle with two sets of chromosomes.

I. I. Hesling

730-ORIAN, G., 1958. "Les galles des racines." Revue Agricole et Sucrière de l'Ile Maurice, 37 (3), 151-158.

This is a very general account of root-knot nematodes (Meloidogyne spp.), the symptoms of disease caused by them and methods of control. M. T. Franklin

731—PUSSARD, R., 1958. "À propos des nématodes des cultures florales." Comptes Rendus des Séances de l'Académie d'Agriculture de France, 44 (13), 688-693.

Root-knot nematodes attack many plants in the flower-growing districts of the south of France, particularly carnations, anemones, roses, acacia, Strelitzia, arums, cyclamens, dahlias, jasmine and tuberose. Rosa centifolia has never shown galls. Meloidogyne incognita, near var. acrita, has been found on Lavandula angustifolia and Althaea officinalis. Many weeds are affected, particularly a new introduction Physalis peruviana. The best treatment of infested land was found to be by means of carbon disulphide, followed after two weeks by D-D. Warm-water treatments were successfully used on anemones, arums and tuberoses. Carnations suffer from attack by Heterodera and, very severely, by Ditylenchus dipsaci. The latter may come from infested narcissus bulbs and can be transmitted in the stems of carnation cuttings. Warm-water treatment may be used for treating the cuttings if 43.5°C, for 15 mins, is not exceeded.

M. T. Franklin

732—RIGGS, R. D. & WINSTEAD, N. N., 1959. [Department of Plant Pathology, University of Arkansas, U.S.A.] "Studies on resistance in tomato to root-knot nematodes and on the occurrence of pathogenic biotypes." Phytopathology, 49 (11), 716–724.

Using the resistant tomato Hawaii 5229 and the susceptible STEP 174, Riggs & Winstead studied various aspects of parasitism by three root-knot nematodes, Meloidogyne incognita, M. incognita var. acrita and M. arenaria. In reciprocal grafts of resistant with susceptible tomatoes a resistant scion did not confer resistance on its susceptible root-stock, neither did a susceptible scion reduce the resistance of its resistant stock. Larvae of M. incognita penetrated the roots of resistant and susceptible tomatoes in similar numbers but necrotic areas appeared within 24 hours around the larvae in resistant plants, no giant cells were found and, 96 hours after inoculation, the larvae appeared to be dead. Small numbers of larvae of the three species succeeded in developing on the resistant tomato, with formation of many giant cells. In the first generation development was slower in the resistant than in the susceptible tomato, but after 15 months in resistant tomatoes a population had arisen which developed as quickly as did the original on susceptible plants. Populations developed on resistant tomatoes and transferred for several generations to susceptible plants of other genera did not lose their ability to develop subsequently on resistant tomatoes. M. incognita from resistant tomatoes (named population B) failed to develop on a number of other resistant plants. Populations derived from single larvae of the B population showed no variations in virulence. It is suggested that the B populations are genetically stable. The B populations differed morphologically from the original populations in the length of the larvae and in the perineal patterns. In all species the larvae from the parent populations were longer than those of the B populations. The perineal patterns, although not typical for their respective species, fell within the range of variability of the species. The new strains appear to be more closely related to each other than each is to its parent population. The potentiality for Meloidogyne species to produce populations capable of reproducing on Hawaii 5229 seems to occur widely. The need for a better understanding of the basis of variation is emphasized. M. T. Franklin

733—SCHREIBER, K. & SEMBDNER, G., 1959. [Biologische Zentralanstalt der Deutschen Akademie der Landwirtschaftswissenschaften zu Berlin, Forschungsstelle für Kartoffelkäferbekämpfung, Mühlhausen, East Germany.] "Über 'Antischlüpfstoffe' für den Kartoffelnematoden in Wurzeldiffusaten." Naturwissenschaften, 46 (13), 434–435.

Schreiber & Sembdner tested the hatching activity of root diffusates from 14 solanaceous plants by incubating cysts of Heterodera rostochiensis in half-strength (diluted with distilled water) diffusate from each plant under test (test A), and in a mixture of equal parts of this diffusate and potato root diffusate (test B). [No water or soil-water controls were used, nor is the duration of the experiment stated.] Hatching in test A ranged from 0.2% (Hyoscyamus niger) to 17.3% (Solanum aviculare), and in the test B from 20% (Physalis philadelphica) to 100% (S. miniatum, Nolana prostrata) of the hatch in the controls (half-strength potato root diffusate). With various samples of tobacco diffusate, the hatch in test A was 0.3-1.4% and in test B, 22-39%, but hatching of cysts treated with tobacco diffusate was not permanently impaired, as they hatched fully when placed subsequently in the control fluid. The authors conclude that some of the diffusates tested are inhibitory, and that the inhibitor in tobacco diffusate is not nematicidal, nor is it identical with nicotine although this also inhibits hatching. The tobacco inhibitor differs in some physical properties from the hatching factor. Other diffusates such as those of N. prostrata and S. miniatum evidently are not inhibitory but are merely inactive.

734—SHEPHERD, A. M. & WALLACE, H. R., 1959. [Nematology Department, Rothamsted Experimental Station, Harpenden, Herts.] "A comparison of the rates of emergence and invasion of beet eelworm Heterodera schachtii Schmidt and pea root eelworm Heterodera göttingiana Liebscher." Nematologica, 4 (3), 227–235. [German summary p. 234.]

Experiments with cysts in sand under controlled moisture conditions indicate that beet eelworm has a relatively higher emergence rate in the presence of host roots than pea root eelworm. It is also shown that the invasion rate of pea root eelworm is considerably higher than that of beet eelworm. It is suggested that this may account for the fact that the population increase of pea root eelworm in the field may be quite substantial, although the emergence rate of larvae from cysts in vitro is so low. Two experiments with beet eelworm are described showing that soil moisture may influence the production of the hatching factor from cress roots and that the rate of diffusion of the hatching factor through sand almost saturated with water is of the order of 0.5 cm. per day. A. M. Shepherd

735-SHER, S. A., 1959. [Department of Plant Nematology, Citrus Experiment Station, University of California, Riverside, California.] "A disease of carnations caused by the nematode Criconemoides

xenoplax." Phytopathology, 49 (11), 761-763.

Sher reports that a disease of carnations, the symptoms of which are a reduced root system, stunted top growth and a reduction in the number of blooms, is caused by the nematode Criconemoides xenoplax Raski. The disease was eliminated when plants were grown in fumigated soil. Plants grown in sterilized loam which had been infected with C. xenoplax developed the disease. A Paratylenchus sp. from the same field soil had no significant effect on carnations. Sher proposes the name "ring nematode decline of carnations" for this disease.

A. M. Shepherd

736—SKARBILOVICH, T. S., 1958. [Parasitic nematodes of clover and maize on collective farms of the Moscow, Voronezh, Lipetsk and Smolensk regions.] Byulleten Nauchno-Tekhnicheskoi Informatsii Vsesoyuznogo Instituta Gelmintologii im. Akademika K. I. Skryabina, No. 4,

pp. 71-74. [In Russian.]

Plant-parasitic nematodes of clover and maize were found to be widely distributed on the 46 farms examined in central European Russia. The species present were Hexatylus vigissi, H. consobrinus, Ditylenchus trifolii and Aphelenchoides spinocaudatus. [The two last-named species appear to be new; but no descriptions are given.] G. I. Pozniak

737-SOUTHEY, J. F., 1959. "Some records of root lesion eelworms, Pratylenchus spp. in England." Plant Pathology. London, 8 (4), 130-132.

Southey reviews the published records of Pratylenchus in Britain. He presents in tabular form more records, some of which are new, of P. penetrans in the roots of Delphineum sp., Helleborus

niger L., Clematis vitalba L., Ranunculus asiaticus L., Anemone coronaria L. and Narcissus, also P. pratensis attacking roots of Avena sativa L., Pisum sativum L. and Vicia faba L., and an unidentified Pratylenchus sp. in the roots of Thalictrum sp. P. penetrans caused well defined lesions on all plants it attacked but no definite root symptoms were associated with P. pratensis attacks. The nematodes were extracted by chopping the roots, homogenizing in water and sieving and filtering the resultant suspension. D. J. Hooper

738—SYLVAIN, P. G., 1959. [Inter-American Institute of Agricultural Sciences, Turrialba, Costa Rica.] "The problem of nematodes in coffee production." Coffee. Turrialba, 1 (1), 2–13. This is a review of the literature on nematodes parasitic on coffee. Reference is made to eight species of nematode and their known geographical distribution is given. Variation in the susceptibility of the different species of coffee is mentioned and methods of extracting nematodes from roots and soil are briefly described. General control methods are outlined and suggestions are made for future work. M. T. Franklin

739—THAMES, Jr., W. H., 1959. [University of Florida, U.S.A.] "Plant parasitic nematode populations of some Florida soils under cultivated and natural conditions." Dissertation Abstracts, 20 (3), 1109-1110.

Thames collected 48 species of nematodes from cultivated soils in Florida, 37 of which were also present in uncultivated soils. There was no evidence of a nematode fauna characteristic of any of the soil series examined. Belonolaimus was, however, apparently restricted to soils of coarser texture; and this was verified experimentally. It was postulated that Belonolaimus was unable to maintain population levels in fine-textured soils because movement was inhibited. I. M. Watson

740-TINNILÄ, A., 1959. "Apila-ankeroinen apilan tuholaisena Soumessa." Maatalous ja Koetoiminta. Helsinki, 13, 218-226. [English summary p. 226.]

In 1958 a nematode-infected clover ley was found near Padasjoki in central Finland. There are only a few cases of stem nematode attack in red clover in Finland reported before. On at least two occasions infections have been caused by nematode-infected seed imported from Sweden. Tinnilä points out the importance of investigating the occurrence of stem nematodes in red clover levs in Finland as much seed has been imported. The best control method at present is the use of nematode-free seed. S. Bingefors

741—WESTER, R. E., CORDNER, H. B. & MASSEY, Jr., P. H., 1958. "Nemagreen—a new lima." American Vegetable Grower, 6 (5), 31–32.

A new bush lima bean has been developed which shows satisfactory resistance to root-knot nematodes. It originated from a cross between Olkahoma 27 and Early Thorogreen; a selection from this cross was then back-crossed to Early Thorogreen, and given the name Nemagreen. The symptoms of root-knot disease on lima bean are briefly described. M. T. Franklin

742—WINSLOW, R. D., 1959. [Nematology Department, Rothamsted Experimental Station, Harpenden, Herts, U.K.] "A note on anhydrotetronic acid as a hatching agent of the beet eelworm, Heterodera schachtii Schm." Nematologica, 4 (3), 237–238. [German summary p. 238.]

Anhydrotetronic acid, which is known to stimulate hatching of Heterodera rostochiensis, was found to stimulate hatching of H. schachtii, thus being less specific than the natural hatching agents and therefore not necessarily closely related or similar in action to them. At the range of dilutions used the acid had no definite stimulatory effect on H. cruciferae or H. humuli.

R. D. Winslow

743-YOKOO, T., 1959. [Faculty of Agriculture, Saga University, Saga-shi, Japan.] [The nematode parasites of more important crops, fruit-trees, and vegetables catalogued under their hosts.] Agricultural Bulletin. Saga University, No. 8, pp. 73-85. [In Japanese.]
Yokoo lists the plant-parasitic nematodes which might be found to be important in Japan.

M. Ichinohe

Insect-Parasitic Nematoda

See Nos.: 802, 811, 892.

Control

See also Nos.: 702, 709, 710, 730, 731, 738, 740.

744—ANON., 1959. "Some diseases of geraniums." Agricultural Gazette of New South Wales,

70 (8), 412–417, 423. This article briefly mentions the leaf nematode, Aphelenchoides olesistus $[=A.\ fragariae]$ and root-knot nematodes, Meloidogyne sp., on geraniums. Treatment of the soil around each plant with "a cupful" of systox consisting of 1 fl. oz. of 50% emulsion in four gallons of water is recommended for the control of the leaf nematode. For root-knot infected plants cuttings should be taken from the upper branches, the remainder of the plant burned and infested soil treated with ethylene dibromide or D-D.

D. J. Hooper

745—ANON., 1959. "Der Einfluss verschiedener Nematocide sowie von *Tagetes erecta* auf Nematoden in Baumschulen und Forstkamps." Berichte aus der Land- und Forstwirtschaftlichen Forschung, 6 (9), 8–9.

From Reinbek, Germany, it is briefly reported that laboratory and field experiments are in progress to study the influence of nematodes in nursery forest plants (particularly conifers) as well as the efficacy of various nematicides on the entire nematode fauna in nursery soils. D-D, methyl bromide, mylone and a preparation made by the firm Bayer which appeared effective, will be tested further. The plant Tagetes erecta effectively controlled pratylenchids but not rotylenchids and tylenchids.

G. I. Pozniak

746—BELL, N. M. G., 1959. [Shell International Chemical Company, Sudan.] "Chemicals for cotton pest control," Span. London, 2 (3), 108–112.

In this general article, Bell briefly reviews the nematode-Fusarium wilt complex of cotton. Trials with Nemagon soil fumigant gave quicker growth and good yield response. Rates of 0.5 to 1 gallon per acre are recommended, using tractor mounted injection equipment, at seed-bed preparation stage.

J. E. Peachey

- 747—CALL, F. & HAGUE, N. G., 1957. [Imperial College of Science & Technology, London.] "Control of plant nematodes." Reports on the Progress of Applied Chemistry, 42, 605–612. Call & Hague review the chemical aspects of soil fumigation, the phenomena of sorption, diffusion and concentration distribution, soil amendment effects and present methods of chemical control of cyst-forming eelworms. Biological control, root-diffusate studies and the breeding of resistant stock are also mentioned.

 J. E. Peachey
- 748—CHAMBERLAIN, E. E. & ATKINSON, J. D., 1959. [Plant Diseases Division, New Zealand Department of Scientific and Industrial Research, Auckland, New Zealand.] "Certification of therapeutants and plant hormones." Information Series. Department of Scientific and Industrial Research, New Zealand, No. 13, 18 pp.

Among the products certified as effective are chloropicrin (Chlorofumapac, Larvacide) and dichloropropene (Shell D-D) for the control of root-knot nematode by soil fumigation. Brief directions for application are given.

J. M. Watson

749—CHRISTIE, J. R. & TAYLOR, A. L., 1958. [Crops Research Division, Agricultural Research Service, Washington, D.C.] "Controlling nematodes in the home garden." Farmers' Bulletin. U.S. Department of Agriculture, No. 2048, 10 pp. [Revised.]

This paper first gives a general account of the biology and pathology of root-knot nematodes (Meloidogyne spp.), stubby root nematodes (Trichodorus spp.), the sting nematode (Belonolaimus gracilis) and strawberry dwarf nematodes (Aphelenchoides spp.). There follows an account of the principles of soil fumigation and a list of soil fumigants. The method of preparing land for fumigation and the method of application of fumigants is given in some detail.

J. J. Hesling

750-DE HAAN, I. & DE SOETEN, G. A., 1958. "Control of eelworm in orchards extremely difficult."

Farming in South Africa, 34 (6), 36-38.

This is a popular account of eelworms with special reference to Meloidogyne javanica, which is found on the roots of peach trees. The authors recommend the removal of diseased trees to control the eelworm. I. I. Hesling

751—DUDDINGTON, C. L., 1959. "Nematode-trapping hyphomycetes and the control of eelworm."

Transactions of the British Mycological Society, 42 (1), 124.

After a short description of the main types of trapping mechanism used by nematophagous fungi, Duddington reviews very briefly the work of Linford on the use of these fungi in nematode control and finally deals with his own experiments on their use against Heterodera major. A. M. Shepherd

752—GERTLER, S. I., FELDMESSER, J. & REBOIS, R. V., 1958. [Entomology Research Division, Beltsville, Md.] "Screening tests on bromoacetates as nematocides." Journal of Agricultural and Food Chemistry, 6 (11), 843-844.

Gertler et al. showed that many of the 53 bromoacetates tested showed high activity against Rhabditis sp. and Panagrellus sp. The most effective were esters of straight chained alcohols with six to twelve carbon atoms, especially the octyl ester (C₁₀H₁₉BrO₂) which gave an L.D. of 95 at 0.8 p.p.m.

753—GRAINGER, J., 1958. "A new soil disease control unit." Research Bulletin. West of Scotland

Agricultural College, No. 25, 46 pp.

Pot experiments showed that various compounds of mercury could control potato-root eelworm and other diseases if applied at a rate of 5 lb. mercury equivalent per acre. This bulletin deals chiefly with the methods of introducing and mixing such compounds into the soil. Work with radio-active iodine has given information on the distribution of a material mixed with a soil and Grainger has used this technique to assess the efficacy of types of mixing machinery. It was found that a rotary cultivator gave the best practical mixing device and that two depth placings of the material were necessary for a uniform distribution to a depth of 9 inches. A production prototype soil disease control unit is described in detail and in field tests it was shown to give good control of potato-root eelworm and other soil-borne diseases.

754—GRAINGER, I., 1958. "Control of soil-borne disease by soil mixing." South African Sugar

Journal, 42 (8), 655, 657.

Grainger investigated the practicability of controlling Heterodera rostochiensis with mercury compounds. Using radio-active iodine to test the effectiveness of mixing with the soil, he evolved a method of applying the necessary dosage, on a field scale, by means of a converted rotary cultivator ("rotavator"), working to a depth of nine inches. Fine-particle yellow oxide, containing 5.5 lb. mercury equivalent per acre, was mixed with 10 cwt. fine particle carrier dust per acre, and the mixture delivered mechanically at two levels, surface and seven inches deep, for incorporation by the rotavator. This treatment reduced the eelworm population on the roots by 60-83% and increased the yield by more than two tons per acre where potatoes were planted on infested land six days after treatment. The economics of the treatment are not known but the heaviest cost may be that of the diluent dust, and the possibility of using fertilizers for this purpose is under investigation. R. D. Winslow

755—GRAINGER, J., 1959. [Department of Plant Pathology, West of Scotland Agricultural College, Auchincruive, Ayr, Scotland.] "Principles and practice for the control of eelworm diseases." International Sugar Journal, 61 (725), 131–133; (726), 163–165.

Grainger, in Part I of his paper, describes the relationship of nematode density to yield and draws from it certain principles of effective control. Problems of eelworm spread and the need for hygiene and good management are discussed. Control methods for planting material using thorough washing, chemicals, fumigants and hot-water treatment are mentioned. For field control Grainger describes his soil mixing method. A nematicidal dust containing up to

5 lb. per acre of mercury (as yellow oxide equivalent) is applied before planting, at two placement depths, by means of a blower attached to a horizontal rotary cultivator which mixes the dust intimately with the soil. Grainger claims a 75% decrease in the root attack by potato-root eelworm and a 1:4 ratio of cost of treatment to value of yield increase. In part II he describes other methods of soil treatment including the injection of D-D, ethylene dibromide and dichlorobromopropane. Vapam and chloropicrin are mentioned in connection with high value crops. Soil temperatures are discussed in relation to fumigant efficiency. Soil drenches of solubilized chemicals in glass-house treatments are useful in treating the upper layers of the soil used for growing high value crops and combine well with other treatments. Soil surface treatment is best for Ditylenchus dipsaci, using D-D or aqueous mercuric chloride, on account of the more superficial distribution. The relative spheres of action of soil mixing, injection, drench and surface treatment are compared. The author then deals with combination of treatments, effect of nematicides on other diseases, consecutive treatments for eradication, and combined crop rotation and chemical control for potato-root eelworm and Meloidogyne. I. E. Peachev Further cost/return estimates are given.

756—GRAINGER, J., 1959. [Department of Plant Pathology, West of Scotland Agricultural College, Auchincruive, Ayr, Scotland.] "Disease control through intimate mixing of mercuric oxide with

soil." Phytopathology, 49 (10), 627-633.

with dibromochloropropane, under certain conditions.

Application of 13 cu. ft. per acre of a dust containing 5 lb. of mercury equivalent of yellow oxide of mercury, six days before planting potatoes and turnips reduced infection by *Heterodera rostochiensis* and infection by *Plasmodiophora brassicae*, *Rhizoctonia solani*, *Colletotrichum atramentarium*, *Spongospora subterranea* and *Erwinia atrosepticum*. The treatment was most effective in disease and pest control during the first two-thirds of seasonal growth. *Fusarium* dry rot infection, *Phytophthora* blight and *Phoma foveata* were not controlled by this treatment. The increase in yield and quality of crops brought about by this treatment suggest economical possibilities. A special cultivator for soil incorporation of the dust is described. H. Jacks

757—HAGUE, N. G. M., 1959. "Effect of methyl bromide fumigation on the potato root eelworm." Plant Pathology. London, 8 (2), 68-70.

Laboratory fumigation of cysts of *Heterodera rostochiensis* exposed to 500–600 mg. per hour per litre methyl bromide gave a highly satisfactory kill of eggs, as assessed by hatching tests in root diffusate. More consistent results were obtained with cysts soaked in water for seven days prior to fumigation than with dry cysts. Hague suggests that incorporation of a nematicide into the washing process of seed potatoes may be effective in control of cysts adhering to tubers.

H. Jacks

758—LANGE, A. H., 1958. [University of Hawaii.] "Response of papaya to soil fumigation." **Down to Earth.** Midland, Michigan, 14 (1), 4-5.

Lange reports growth and yield responses of papaya from trees planted on fumigated soil. This response is attributed, in part, to some initial control of *Rotylenchulus reniformis*, as determined by sampling three and eight months after fumigation. Pre-plant treatment with dibromochloropropane, at 8 [U.S.] gal. per acre gave the greatest plant response and slowest post-treatment recovery of nematode infestation. D-D was less satisfactory in its over-all effect. Under poorly drained conditions, methyl bromide gas, chloropicrin and sodium methyldithiocarbamate (Vapam) have shown promise, whereas ethylene dibromide, dibromochloropropane and dichloropropene types did not. Practical control seems likely

759—MARTIN, G. C., 1959. [Branch of Entomology, Federal Ministry of Agriculture, Causeway, Southern Rhodesia.] "Control of root-knot nematodes (*Meloidogyne* spp.) in gardens and nurseries." Rhodesia Agricultural Journal, 56 (2), 65–68.

This is a short popular account of root-knot nematodes written for nurserymen and gardeners, giving information on sources of infection and control by soil fumigation and general hygiene.

G. C. Martin

J. E. Peachey

760—MYERS, R. F. & DROPKIN, V. H., 1958. "Effects of X-rays and γ-irradiation on soil and plant-parasitic nematodes." [Abstract of paper presented before the Radiation Research Society, 1958.] Radiation Research. New York, 9 (1), 158.

Ten genera of plant-parasitic nematodes and three genera of free-living nematodes were exposed to graded doses of radiation. The dosage required for complete sterilization varies greatly between genera. Myers & Dropkin suggest that the ability of nematodes to survive large doses of irradiation is probably correlated with the cell constancy in these forms. They conclude that the dosage necessary for sterilization is too high to make radiation a practicable means of control for plant-parasitic nematodes.

761—OKANO, A. & TANAKA, I., 1959. [On the effective limit of the nematicide, EDB and its chemical

injury.] Kyushu Agricultural Research, No. 21, pp. 151-152. [In Japanese.]

The authors compared the phytotoxicity of EDB to tobacco with that of chloropicrin and found the former to be the less toxic. 6 ml. EDB (20% by weight) was approximately equivalent to 2 c.c. chloropicrin in killing nematodes. M. Ichinohe

762—PHILLIPS, F. T., 1959. [Imperial College Field Station, Sunninghill, Ascot, Berks, U.K.] "Effect of emulsifiers and organic diluents in soil insecticide and nematicide formulations." [Corres-

pondence.] Nature. London, 184 (4697), 1512-1513.
Phillips observes, following experiments with ethylene dibromide formulations, that the use of emulsions and diluents may markedly affect the dispersion of the toxic agent through the soil. Ethylene dibromide emulsions moved through the soil at slower percolation rates than pure water—a change in soil structure appears to be the reason. Emulsions were retained longer and broken more in peaty soil compared to sandy loam. White sand columns did not break the emulsions. In another experiment, enhanced ethylene dibromide sorption occurred when organic diluents were used. I. E. Peachy

763-PITCHER, R. S., 1959. [East Malling Research Station, Kent.] "The chemical control of leaf and bud eelworms (Aphelenchoides spp.) and stem and bulb eelworm (Ditylenchus dipsaci) on strawberries." Journal of Horticultural Science, 34 (2), 61-71.

Pitcher describes the preliminary testing of a number of organo-phosphorus substances as nematicides against Aphelenchoides ritzema-bosi. Parathion proved to be the most acceptable compound and was therefore used in extensive field testing against this species, A. fragariae and Ditylenchus dipsaci. Reduction in the infestation level was achieved with parathion as a post-planting drench or spray—or more successfully as a 0.1% pre-planting dip. There was no correlation between eelworm reduction and yield increase. Significant yield increases following spray treatment were attributed to some other treatment effect, possibly in the soil microflora and fauna. I. E. Peachev

764—REDDY, B. R., 1959. [University of Florida, U.S.A.] "The germination of vegetable and field crop seeds as affected by two soil fumigants." **Dissertation Abstracts**, **20** (3), 843.

Reddy found that the volatile soil fumigants D-D and ethylene dibromide inhibited the germination of most seeds tested in laboratory, green-house and field-plot experiments. At soil temperatures higher than 68°F. the toxicity to germinating seeds was reduced by rapid volatilization and escape of the fumigants. D-D was more toxic than ethylene dibromide except to I. M. Watson transplanted tomato seedlings.

765—RITTER, M., 1958. "Essais préliminaires d'utilisation pratique de la chloropicrine dans la lutte contre l'anguillule des racines Meloidogyne incognita en culture maraichère." Phytiatrie-Phyto-

pharmacie, 7 (2), 73-80. Ritter describes the evaluation of chloropicrin for market garden use against Meloidogyne incognita in light and heavy soils. Chloropicrin was applied at 300 or 600 kg. per hectare and compared to D-D at 400 litres per hectare. All treatments caused yield increases and reductions in infestation. Yield increases were not necessarily correlated with nematode control. The greater increases in yield were from chloropicrin-treated plots, particularly in heavy soils. D-D was more effective in controlling root-knot, although the higher dose of chloropicrin was nearly as effective as D-D in lighter soils. The covering of chloropicrin treated plots with a paper seal did not significantly improve fumigation performance. Complications in the practical application of chloropicrin are toxicity to man, animals and certain plants, as well as difficulties of handling.

J. E. Peachey

766—SAUER, M. R. & GILES, J. E., 1959. [C.S.I.R.O., Commonwealth Research Station, Merbein, Victoria, Australia.] "Nemagon and Vapam for the control of root knot of field tomatoes." Journal

of the Australian Institute of Agricultural Science, 25 (2), 138-141. Sauer & Giles describe experiments to control root-knot (Meloidogyne javanica) infecting tomatoes in Victoria, Australia, using soil fumigants. In trials, Nemagon at up to 5 gallons per acre broadcast and at one-and-a-quarter gallons per acre double row treatment, and ethylene dibromide (15%) at 20-40 gallons per acre broadcast, gave good control of root-knot and increased yields of tomatoes. Vapam gave good control and the highest yields at 80 gallons per acre broadcast. Lower rates, or row application, of Vapam were ineffective. Plots treated with Nemagon or ethylene dibromide in 1956 still showed appreciable effects in the 1957 season, after replanting. Retreatment in 1957 with the same fumigants, however, gave greater yields than the 1956 single treatment plots. A similar, but non-significant effect was observed with Vapam after retreatment. Stauffer N-244 (3-parachlorphenyl-5-methyl rhodanine) was ineffective on plants or nematodes. It is suggested that the most effective and economic control measure is the use of Nemagon, as a double row annual treatment, at about one gallon per acre. Ethylene dibromide as a row treatment is expected to give similar results to Nemagon and doses below 20 gallons per acre are expected to be effective. Vapam is too expensive to compete with these two chemicals. I. E. Peachev

767—STETTMEIER, W., 1957. [Bayerische Landesanstalt für Pflanzenbau und Pflanzensch itz, Aussenstelle Würzburg.] "Bekämpfung des Wurzelgallenälchens im Gemüsebau mittels Natriummethyldithiocarbamat."
 Pflanzenschutz. Munich, 9 (12), 183–184.

After referring in general terms to root-knot disease in glass-house crops, Stettmeier mentions the usual control methods and their relative merits. He tested a new chemical, sodium-n-methyldithiocarbamate (Vapam), and found that after application of 150 c.c. in 2 litres of water per sq. m. cucumbers remained free from galls, while plants on the untreated plots had 67 galls per metre of root. For successful treatment the soil temperature and moisture must be favourable, the soil must be well mixed and time allowed for the breakdown of old galls before application of the chemical.

M. T. Franklin

768—TANAKA, I., 1959. [Nagasaki Agricultural Experiment Station, Isahaya-shi, Japan.] [Rice seed treatment test with rhodanateacetic esters for the control of white-tip nematode.] Kyushu Agricultural Research, No. 21, pp. 152–153. [In Japanese.]

Rhodanateacetic esters (REE-200, REM-200, REB-200) were tested for controlling the white tip nematode, Aphelenchoides besseyi, by dipping the nematode-infected seeds in 1:600 and 1:200 solutions of each chemical containing 20% of active ingredient. It was found that seeds which were dipped in 1:600 of REE-200 for 24 hours gave the best results with 99% germination, 9.6 cm. height of growth and no diseased plants. Seeds in 1:200 of REE-200 showed 97% germination, 9.0 cm. height of growth.

M. Ichinohe

769—UHLENBROEK, J. H. & BIJLOO, J. D., 1958. [N-V. Philips-Roxane Central Research Laboratory, Weesp and Agrobiological Laboratory "Boekesteyn", 's-Graveland, Netherlands.] "Investigations on nematicides. I. Isolation and structure of a nematicidal principe occurring in Tagetes roots." Recueil des Travaux Chimiques des Pays-Bas. Amsterdam, 77 (1), 1004–1009. Uhlenbroek & Bijloo describe the isolation of some highly nematicidal polythienyls from roots of Tagetes plants. Of these, a substance identified as α-terthienyl appears to be the most active. Median lethal doses varying from less than 5 to 0·1 p.p.m. are given in results from in vitro tests for six days with Ditylenchus dipsaci, Anguina tritici and Heterodera rostochiensis. It is concluded that the suppressing effect of Tagetes on nematode populations is due to the presence of polythienyls, especially α-terthienyl.

J. E. Peachey

Miscellaneous

770—CHITWOOD, B. G., 1957. [State Plant Board of Florida, Gainesville, Florida.] "The English word 'nema' revised." Systematic Zoology. Washington, D.C., 6 (4), 184–186. Chitwood reviews the history of the words "nema", "nematoid", "nematode" etc. and makes

a plea that "nema" should be universally accepted as the basic word in nematology.

J. B. Goodey

TAXONOMY

Monogenea

771—BIKHOVSKI, B. E., 1957. [Monogenetic trematodes, their classification and phylogeny.] Moscow & Leningrad: Izdatelstvo Akademii Nauk SSSR., 509 pp. [In Russian.] This monograph, in which Bikhovski undertakes a thorough analysis of the Monogenea, is divided into three parts. Part one includes sections on morphology, biology, development and life-cycles; part two comprises sections on the occurrence of monogenetic trematodes in their fish, amphibian and reptilian hosts, on host specificity and a study of the monogenetic fauna under hosts; part three deals with the phylogenetic relationships and a revised classification of the Monogenea. The classification is based on the system proposed by Bikhovski in 1937 and which has been brought up to date. The Monogenoidea comprises the two subclasses Polyonchoinea and Oligonchoinea. The Polyonchoinea comprises the three orders Dactylogyridea, Tetraonchidea n. ordo and Gyrodactylidea. The Dactylogyridea is divided into (i) Dactylogyrinea which contains the families, (a) Dactylogyridae with the subfamilies Dactylogyrinae, Ancyrocephalinae and Linguadactylinae n.subf. (Tetraonchinae Monticelli, 1903, part.) erected for the type and only genus Linguadactyla; (b) Diplectanidae n.fam. (Dactylogyridae Bikhovski, 1933, part.) with the subfamilies Diplectaninae and Rhamnocercinae; (c) Protogyrodactylidae; (d) Calceostomatidae; and (ii) Monopisthocotylinea which contains the families (a) Monocotylidae with the subfamilies Monocotylinae, Calicotylinae, Merizocotylinae and Dasybatotreminae n.subf. (Monocotylinae Gamble, 1896, part.) erected for the type and only genus Dasybatotrema; (b) Loimoidae n.fam. (Monocotylidae Taschenberg, 1879, part.; Loimoinae Price, 1936) erected for the genera Loimos (type) and Loimosina; (c) Dionchidae n.fam. (Monocotylidae Taschenberg, 1879, part.; Dionchinae Johnston & Tiegs, 1922) erected for the type and only genus *Dionchus*; (d) Capsalidae with the subfamilies Capsalinae, Trochopodinae, Encotyllabinae, Nitzschiinae, Megalocotylinae n.subf. (Trochopodinae (Price, 1936) Sproston, 1946, part.) erected for the genera Megalocotyle (type), Macrophyllida and Sprostonia n.g. containing Megalocotyle squatinae and Entobdellinae n.subf. (Benedeniinae Johnston, 1931, part.) erected for the type and only genus Entobdella; (e) Acanthocotylidae with the subfamilies Acanthocotylinae and Enoplocotylinae; (f) Microbothriidae. The Tetraonchidea n.ordo (Tetraonchinea Bikhovski, 1937) contains the families (a) Tetraonchidae; (b) Tetraonchoididae; (c) Amphibdellatidae (which is emended and includes only Amphibdella of which Amphibdelloides is made a synonym); and (d) Bothitrematidae n.fam. (Bothitrematinae Price, 1936) with the type and only genus Bothitrema. The Gyrodactylidea is divided into (i) Gyrodactylinea containing Gyrodactylidae, and (ii) Polyopisthocotylinea containing Sphyranuridae and Polystomatidae in which the new genus Protopolystoma n.g. is erected for Polystoma xenopi. The Oligonchoinea contains three orders: (1) Diclybothriidea n.ordo with the families Diclybothriidae and Hexabothriidae; (2) Chimaericolidea n.grad. (Brinkmann's, 1952, superfamily Chimaericolidea raised to the rank of an order) containing only Chimaericolidae; (3) Mazocraeidea n.ordo (Diclidophoroidea Price, 1936; Dactylocotyloidea Brinkmann, 1942) which is divided into (i) Mazocraeniea n.subordo containing Mazocraeidae and Hexostomatidae, and (ii) Discocotylinea n.subordo containing Discocotylidae, Plectanocotylidae, Diclidophoridae, Microcotylidae, Protomicrocotylidae, Gastrocotylidae, and Anthocotylidae n.fam. (Discocotylidae Price, 1936, part.; Anthocotylinae Price, 1936) erected for the genera Anthocotyle (type), Winkenthughesia, probably Vallisia, and Tagia (the last is mentioned in a footnote). The classification lists the genera contained G. I. Pozniak in each family but species are not included.

772—JAIN, S. L., 1958. [Indian Statistical Institute, Calcutta-35, India.] "New species of the genus Urocleidus Mueller, 1934, from the gill filaments of some Indian fishes." Journal of the Zoological

Society of India, 10 (2), 155-164.

A discussion of the taxonomy of the genus Urocleidus is followed by a description of U. xenentodoni n.sp. from the gills of Xenentodon concila. U. xenentodoni differs from U. fundulus Mizelle, 1940 and U. seculus Mizelle & Arcadi, 1945 as it possesses a spirally coiled cirrus with an accessory piece which together with the ventral bar of the haptor have a characteristic shape. Jain states that U. rhyncobdelli n.sp. is the seventh species of the genus Urocleidus from India. It is found on the gills of Rhynchobdella aculeata and differs from U. adspectus Mueller, 1934 and U. xenentodoni in the shape of the dorsal and ventral anchor bases, of the ventral bar and of the accessory piece. A key is given for the identification of the Indian species of Urocleidus.

H. H. Williams

Aspidobothria

No relevant abstracts in this issue

Digenea

See also Nos.: 817, 822.

773—ANANTARAMAN, S., 1959. [University Zoology Laboratory, Chepauk, Madras 5, India.] "Metacercaria (Allocreadioidea) in the planktonic etenophore, Pleurobrachia globosa Moser 1903, from the Madras coast." [Correspondence.] Nature. London, 183 (4672), 1407–1408.

A new metacercaria is reported from Pleurobrachia globosa in a collection of Madras inshore plankton. Between one and three parasites were found in the gastric cavity of 8 out of 14 etenophores examined. The body is elongate with a conspicuous large oral sucker. A smaller ventral sucker lies behind the fork of the oesophagus. The parasite differs from Opechona bacillaris, the only other metacercaria known from a etenophore, in having wide lateral excretory canals forming a V-shaped pattern, glandular structures associated with the oral sucker and no pre-pharynx. Under La Rue's new system, the metacercaria falls under the superfamily Allocreadioidea Nicoll, 1934, and probably into the family Allocreadiidae.

N. A. Hancock

774—CHENG, T. C., 1959. [University of Virginia, U.S.A.] "Systematic, morphological, and life history studies on the trematode family Brachycoeliidae Johnston, 1913." Dissertation Abstracts, 20 (4), 1134.

Cheng states that his thesis contains revised definitions of the family, subfamilies and genera, fully annotated lists of species, and keys. He recognizes four subfamilies, as follows: (i) Brachycoeliinae, comprising Brachycoelium and Cymatocarpus; (ii) Leptophallinae, containing Leptophallus only; (iii) Glypthelminae n.subf., comprising Glypthelmins, Margeana and Reynoldstrema n.g. [for abstract of description see Helm. Abs., 28, No. 9a.]; and (iv) Mesocoeliinae, containing only Mesocoelium (of which Pintnaria is considered to be a synonym). Reference is made to a new species of Brachycoelium—B. elongatum n.sp. [for abstract of description see Helm. Abs. 27, No. 7a]. [No definition of the new taxa mentioned are given]. Brachycoelium obesum is stated to utilize only one intermediate host, either Zonitoides ligerus or Agriolimax agrestis, within which the parasite undergoes two sporocyst generations and a cercarial generation. The latter transforms into an encysted metercercaria which develops into the adult when ingested by Plethedon cinerus. The eggs of the worm do not develop into miracidia until ingested by the intermediate host.

J. M. Watson

775—LEE, H. F. & SEO, B. S., 1959. [Division of Parasitology, Tulane Medical School, New Orleans 12, Louisiana, U.S.A.] "A new large-tailed echinostome cercaria from Amnicola limosa (Say) in the Douglas Lake region of Michigan." Transactions of the American Microscopical Society, 78 (2), 215–219.

Lee & Seo describe and illustrate Cercaria illecebrosa n.sp. from Amnicola limosa from the Douglas Lake region of Michigan. The redia, and metacercaria (obtained from the gills of

experimentally infected *Eucalia inconstans* and *Lebistes reticulatus*) are also described but an attempt to obtain adults by feeding metacercariae to a pigeon was unsuccessful. The new cercaria resembles *C. limosae*, from the same host, most closely but may be differentiated by the longer tail (1·82–2·21 mm. in *C. illecebrosa*, 0·57–1·05 mm. in *C. limosae*) and by the presence in the tail of *C. limosae* of a posterior triangular chamber of the excretory bladder which was not observed in *C. illecebrosa*. It seems likely that it belongs to the genus *Stephanoprora*.

S. Willmott

776—POJMAŃSKA, T., 1959. [Zakład Parazytologii, Polska Akademia Nauk, Warszawa, Pasteura 3, Poland.] "Metacercariae of some Brachylaemidae (Trematoda) in land snails of the Białowieża National Park." Acta Parasitologica Polonica, 7 (13/22), 343–369. [Polish summary p. 369.] Eighteen species of molluscs were examined at the Białowieża National Park and four species of brachylaemid metacercariae found. (i) Brachylaemus fulvus was present in 26 of 531 Zonitoides nitidus and one of 165 Goniodiscus rotundatus. As its synonyms are listed B. migrans var. a. Dujardin, 1845, Panopistus europaeus Soltys, 1951, B. oesophagei Shaldibin, 1953 and, with some reservation, Harmostomum dujardini Baer, 1928. (ii) B. spinulosus was found in 14 of 329 Succinea putris, 2 of 491 Perforatella bidens and once in Eulota fruticum (the last two are new host records). The adults were reared experimentally in the hedgehog Erinaceus europaeus. These and the metacercariae found resemble B. virginiana more closely but in view of the final host and geographical distribution they are placed in B. spinulosus. Probably these two species are synonymous. (iii) S. putris and P. bidens further contained metacercariae which were described by Soltys in 1951 as Leucochloridium soricis but are now placed in Pseudoleucochloridium n.g. because of the ventral position of the genital pore, the vitellaria which reach only to the middle of the ventral sucker, and some biological differences. L. skrjabini is very similar to this species, and should the genital pore prove ventral on its re-examination, it would fall as a synonym. Panopistus pricei is also placed in the new genus. (iv) An unidentified species of Leucochloridium was present in Goniodiscus ruderatus. The four metacercariae are described. G. I. Pozniak

777—SOGANDARES-BERNAL, F. & HUTTON, R. F., 1959. [Florida State Board of Conservation Marine Laboratory, Maritime Base, Bayboro Harbor, St. Petersburg, Florida.] "Studies on helminth parasites from the coast of Florida. III. Digenetic trematodes of marine fishes from Tampa

and Boca Ciega Bays." Journal of Parasitology, 45 (3), 337-346.

A diagnosis is given for Diploproctodaeum vitellosum n.sp. from Lagocephalus laevigatus (Linn.), with a discussion including the differences between this species and D. holocentri, D. tetraodontis, D. haustrum, D. cryptostoma, D. hemistomum and D. plicitum. [These differences do not lend themselves to abstraction.] Brief descriptions of nine other digenetic trematodes from marine fishes or invertebrate intermediate hosts collected off the coast of Florida give the hosts, incidence, location and notes on the taxonomy of the species. Prosorhynchus sp., D. plicitum, Multitestis rotundus, Stephanostomum sp., S. promicropsi, Opecoeloides fimbriatus, Lasiotocus minutum and Diphterostomum americanum are new locality records. New host records are: Prosorhynchus sp. from Chilomycterus schoepfi; D. plicitum from C. schoepfi; Stephanostomum sp. from Acanthostracion tricornis; L. minutum from Fundulus similis and D. americanus from Gobiosoma robustum, Lagodon rhomboides and Opsanus beta. The name changes proposed are: Opecoeloides fimbriatus n.comb. for Fimbriatus fimbriatus and Lasiotocus minutum n.comb. for Proctotrema minuta.

778—STUNKARD, H. W., NIGRELLI, R. F. & GANDAL, C. P., 1958. [American Museum of Natural History, New York.] "The morphology of Renicola philippinensis n.sp., a digenetic trematode from the pheasant-tailed jacana, Hydrophasianus chirurgus (Scopoli)." Zoologica. Scientific Contributions of the New York Zoological Society, 43 (3), 104-112.

At an autopsy on a pheasant-tailed jacana from the Philippine Islands about fifty worms belonging to the genus *Renicola* were found in pairs in cystic spaces in the renal tubules. The worms, which were sexually mature, are described provisionally as *Renicola philippinensis* n.sp. The literature of species already recorded and of the life-history of the genus is summarized and it is shown that these worms do not correspond to previously described

species in one or more of the following characters, viz., the extent and location of the vitellaria, the extent of the uterus, location of the acetabulum and gonads, the total size and size of individual organs especially of the suckers. This is the first record of a *Renicola* from south-east Asia.

R. T. Leiper

779—STUNKARD, H. W. & UZMANN, J. R., 1958. [American Museum of Natural History, New York, 24, N.Y., U.S.A.] "Studies on digenetic trematodes of the genera Gymnophallus and Parvatrema." Biological Bulletin, 115 (2), 276–302.

Stunkard & Uzmann describe three types of sporocysts and cercariae and four types of metacercariae from four species of marine bivalves, and four types of adult gymnophalline flukes from naturally and experimentally infected Somateria mollissima, all from coastal waters off the States of Maine, Massachusetts and New York. Adult forms Nos. I, II, and III are members of the genus Gymnophallus. Adult No. I may be G. bursicola Odhner, 1900 or G. dapsilis Nicoll, 1907. Adult No. II may be G. deliciosus (Olsson, 1893) or G. choledochus Odhner, 1900. Adult No. III, recovered from the intestines of a hamster and a ten-day-old eider duck fed metacercariae (the authors' Metacercaria No. II) from Mytilus edulis taken at Long Island Sound, New York, may be G. bursicola. Parvatrema borealis n.sp. is proposed as the name for Adult No. IV, recovered from laboratory-reared S. mollissima after experimental feeding of the authors' Metacercaria No. IV (from Gemma gemma taken at Boothbay Harbour, Maine). P. borealis is distinguished from P. borinqueñae Cable, 1953 chiefly in geographical location and choice of primary and secondary hosts. The authors' sporocysts and Cercaria No. III from G. gemma at Boothbay Harbour, may be those of P. borealis, but this has as yet not been certainly established. The authors' Metacercaria No. I from Mya arenaria and No. III from Hiatella arctica did not persist or develop in mice, hamsters, eider ducks or herring gulls, and their status is thus uncertain. Sporocysts and Cercaria No. I from M. arenaria, previously described as Cercaria myae Uzmann 1952, still cannot be identified with any known metacercariae or adults. Sporocysts and Cercaria No. II from Hiatella arctica at Boothbay Harbour, are referred to Cercaria reesi Hutton, 1953 originally described from H. arctica and H. striata at Plymouth, England. Attempts to infect molluscs with embryonated eggs recovered from adult worms present naturally in the bursa Fabricii of eider ducks were fruitless, although the authors suggest the bivalves become infected in nature when eggs are carried into the mantle cavity with water currents, are then enmeshed in the mucus covering the gills, and reach the digestive tract via the stream of material drawn to the mouth from the gills. Transfers of metacercariae from one species of bivalve to another or between molluscs of the same species were attempted, with equivocal results. The authors present a long historical review of described gymnophalline sporocysts, cercariae, metacercariae and adults. The worms described as Gymnophallus ovoplenus Jameson & Nicoll, 1913 are transferred to the genus *Parvatrema* Cable, 1953. E. I. Sillman

780—VAIDOVA, S. M. & FEIZULLAEV, N. A., 1958. [Clinostomum kassimovi n.sp. from the digestive tract of Ardea cinerea.] Dokladi Akademii Nauk Azerbaidzhanskoi SSR., 14 (10), 805-807. [In Russian.]

Clinostomum kassimovi n.sp. was found in the digestive tract of one out of ten Ardea cinerea from the Lenkoran area. It differs from all other species in this genus, except C. sorbens, in that the anterior margin of the vitellaria is in front of the ventral sucker. The testes are branched and lie anteriorly in the posterior half of the body, while in C. sorbens the unbranched testes are situated in the posterior end of the hind-body.

G. I. Pozniak

781—WAITZ, J. A., 1959. [Department of Biological Sciences, University of Idaho, Moscow, Idaho, U.S.A.] "A revision of the genus *Haplometrana* Lucker, 1931 (Trematoda: Plagiorchiidae), with notes on its distribution and specificity." **Journal of Parasitology**, 45 (4), 385–388. From a study of 338 specimens of the two described species of the genus *Haplometrana*, *H. intestinalis* and *H. utahensis*, from the small intestines of 46 specimens of *Rana pretiosa*

and 19 specimens of a hybrid cross R. pretiosa × R. sylvatica from the States of Washington, Idaho and Utah, Waitz considers the two species to represent two ends of a cline, in the centre of which is Idaho. He has, therefore, reduced H. utahensis to synonymy with H. intestinalis. An emended diagnosis is given for Haplometrana, embodying the rather variable morphology presented by these flukes. H. intestinalis is found to be highly host specific, being found almost exclusively in R. pretiosa.

E. I. Sillman

Cestodaria

No relevant abstracts in this issue

Cestoda

See also No.: 817.

782—ANANTARAMAN, S. & KRISHNASWAMY, S., 1958. [University Zoology Laboratory, Madras 5, India.] "Tetraphyllidean larvae in the marine copepod, Eucalanus pseudattenuatus Sewell, from the Madras coast." Journal of the Zoological Society of India, 10 (1), 1-3.

A short description is given of an unidentified tetraphyllidean larva from the body-cavity and appendages of *Eucalanus pseudattenuatus* which had undergone parasitic castration as a result of the infection. Previous records of larval cestodes from copepods are discussed.

H. H. Williams

783—DUBININA, M. N., 1959. [Zoological Institute, Academy of Sciences of the U.S.S.R., (Leningrad).] [The natural classification of the genus *Schistocephalus* Creplin (Cestoda, Ligulidae).] Zoologicheski Zhurnal. 38 (10), 1498-1517. [In Russian: English summary p. 1517.]

logicheski Zhurnal, 38 (10), 1498-1517. [In Russian: English summary p. 1517.]

Dubinina gives a diagnosis of Ligulidae n.fam. which contains Ligula, Digramma and Schistocephalus and for which she lists as synonyms Ligulinae Lühe, 1899 and Ligulidae (Lühe, 1899) raised by her in 1957 from subfamily rank [for abstract see Helm. Abs., 26, No. 480d]. A careful morphological examination of Schistocephalus plerocercoids from various fish hosts and cross infection experiments with material from Pungitius pungitius and Gasterosteus aculeatus, have shown that S. solidus is a collective species. Dubinina thus distinguishes (i) S. solidus (sensu stricto) with plerocercoids in G. aculeatus and strobila with 80 to 150 proglottides (95 to 175 from Cottidae), (ii) S. pungitii n.sp. with plerocercoids in P. pungitius and strobila with 65 to 95 proglottides and (iii) S. nemachili n.sp. with plerocercoids in Nemacheilus crassus and proglottides exceeding 200. The three species are described. Dubinina concludes that the plerocercoid stage is the basic phase of Ligulidae as it is the longest phase in the life-cycle and possesses almost all the morphological characters of the adult.

G. I. Pozniak

784—JOHRI, G. N., 1959. [Department of Zoology, Lucknow University, India.] "On a remarkable new caryophyllaeid cestode, *Hunteroides mystei* gen. et sp.nov. from a fresh water fish in Delhi State." Zeitschrift für Parasitenkunde, 19 (4), 368–374.

A description is given of a new caryophyllaeid cestode, Hunteroides mystei n.g., n.sp., found in the intestine of a siluroid fish, Mystus seenghala. This worm is differentiated from the other eight genera included in the family Lytocestidae, namely, Lytocestus, Balanotaenia, Monobothroides, Djombangia, Lytocestoides, Khawia, Stocksia and Bothrioscolex, by the presence of a conical, muscular scolex which is sharply demarcated from the body and in having an ovary which is elongate and not H-shaped in form. In addition, Hunteroides differs from Lytocestoides and Khawia by having only pre-ovarian vitelline follicles but they are not arranged in two crescents as in Stocksia. The fact that the vitelline follicles are confined to the cortex is another feature which distinguishes Hunteroides from Khawia and Stocksia. The uterus in Hunteroides extends as three winding tubes throughout the entire length of the body whereas in Lytocestus the uterine coils lie posterior to the wings of the ovary and they are relatively shorter in all the other forms with the exception of Monobothroides. Johri disagrees with previous classifications which utilize the position of the genital openings as a character of the

family Wenyonidae since the other three families, Lytocestidae, Capingentidae and Caryophyllaeidae, in the order Caryophyllidea are distinguished on the location of the vitelline follicles. He proposes that the forms included in the Wenyonidae be transferred to the subfamily Wenyoninae of the family Caryophyllaeidae so that one feature, namely the location of the vitelline glands, separates the families and the position of the genital apertures is employed for distinguishing the subfamilies. The author considers that *Khawia* and *Stocksia* should be removed from the Lytocestidae since, unlike the other genera of this family, the vitelline follicles are located in both the cortex and in the medulla. He provisionally places them in a new family Lallidae. Johri is of the opinion that *Bothrioscolex* is a valid genus and is not a synonym of *Khawia* as suggested by Fotedar (1958) or of *Lytocestoides* as Woodland (1928) believed. He considers that *Lytocestus alestesi* erected by Lynsdale (1956) is synonymous with *L. birmanicus*.

785—TENORA, F., 1959. [Agricultural & Forest Science Institute (Brno, Czechoslovakia).] [Revision of the classification of platyhelminths of the family Catenotaeniidae Spasski, 1950.] Zoologicheski

Zhurnal, 38 (9), 1322-1334. [In Russian: English summary p. 1334.] Tenora, working on material collected from Muridae in Czechoslovakia, revises the family Catenotaeniidae and emends the diagnoses of its genera and species. Catenotaenia Janicki, 1904, which is characterized by a branched uterus the main truck of which reaches to the end of the proglottis, is divided into three subgenera: (i) Catenotaenia n.subg. (s.str.), in which the testes lie at the posterior end of the proglottis behind the other genitalia, contains C. pusilla, C. cricetorum, C. cricetorum f. glareolica n.forma, C. dendritica, C. geosciuri, C. linsdalei and C. rhombomydis; (ii) Spasskijela n.subg., in which the testes are also found at the sides of female genitalia, contains C. lobata, C. capensis and C. kratochvili n.sp.; and (iii) Meggittina n.subg. (for the genus Meggittina Lynsdale, 1953), in which the testes lie in the anterior portion of the segment in front of the ovary and anteriorly may reach to the sides of the segment, contains only C. baeri n.comb. C. cricetorum glareolica is the name given to Catenotaenia sp. Tenora, 1957, from Clethrionomys glareolus and the species is now described. Its hermaphrodite segments are broad, the testes number 100 to 140 and the uterus bears 19 to 24 branches on each side which subdivide further in an aborescent manner, while in C. cricetorum the uterine branches are simple and the hermaphrodite segments are elongated. C. kratochvili from Apodemus flavicollis has 10 to 14 simple branches on each side of the uterus, the testes number 190 to 220, lie laterally and unite at the posterior end in all proglottides. The second genus in the family, Skrjabinotaenia, contains only S. oranensis and is characterized by the uterus which has a short trunk with branches arising only at its base and leading laterally and posteriorly. A key is given to the genera and species described. G. I. Pozniak

Acanthocephala

See also No. 660.

786—GOLVAN, Y. J. & ORMIÈRES, R., 1957. "Présence d'un juvénile du genre Gordiorhynchus A. Meyer 1931 (Acanthocephala Polymorphidae) chez un acridien du Congo Belge." Exploration du Parc National Albert. Brussels, Deuxième série, No. 5, pp. 85–89.

Golvan & Ormières describe an encysted juvenile of *Gordiorhynchus* sp. which was found in a *Catantops quadratus* at Malingongo in the Belgian Congo. This is the first record of an acanthocephalan larva in a member of the Acridoidea. The most oustanding morphological characteristics were: the presence of a double muscle layer in the wall of the receptacle, inserted at the level of the narrow part of the proboscis; the presence of true hooks on the proboscis above the point of insertion and spines below; and the absence of cuticular ornamentation. It appears to belong to the subgenus *Gordiorhynchus*.

S. Willmott

Nematoda

See also Nos.: 503, 651, 736, 819, 820, 822.

787-ANDRÁSSY, I., 1957. [Institut für Tiersytematik der Universität, Budapest.] "Zwei neue Arten der Gattung Amphidelus Thorne, 1939." Opuscula Zoologica. Instituti Zoosystematici

Universitatis Budapestinensis, 2 (3), 3-8.

Amphidelus dudichi n.sp. (female) and A. coronatus n.sp. (female) are described and figured from fresh water in Hungary. A. dudichi is close to A. dolichurus but is bigger and has the amphids more anteriorly placed. Andrássy points out that other authors have described A. dolichurus with differing dimensions and suggest that his species may be identical with some previously described. A. coronatus has a short protruding tube on the middle of its head end surrounded by about ten small crown-like papillae. In other respects it is close to A. dolichurus. I. B. Goodev

788—ANDRÁSSY, I., 1957. [Institut für Tiersystematik der Universität, Budapest.] "Dorylaimus rugosus n.sp., ein neuer Nematode aus Ungarn. Nematologische Notizen. 7." Opuscula Zoologica. Instituti Zoosystematici Universitatis Budapestinensis, 2 (3), 9-11.

Dorylaimus rugosus n.sp. (female) is described and figured. It was found in sandy garden soil in Budapest. It differs from D. carteri in the peculiar head shape with characteristic wrinkled lips and very strongly developed vaginal walls. I. B. Goodev

789—ANDRÁSSY, I., 1958. "Ergebnisse der zoologischen Aufsammlungen des Ungarischen Naturwissenschaftlichen Museums in Ägypten im Jahre 1957. 2. Nematoden aus ägyptischen Gewässern." Annales Historico-Naturales Musei Nationalis Hungarici, Series nova, 9, 135–150.

Andrássy describes a small collection of nematodes from inland waters of northern Egypt, both fresh-water and brackish. Theristus borosi n.sp. from brackish lakes is similar in spicular structure to T. flevensis and T. ambronensis but is distinguished by the shape of the gubernaculum and head and tail characters. Diplolaimelloides delyi n.sp. from a brackish lake is distinguished from all other species in the pattern of bursal papillae. Dorylaimus aegypticus n.sp. from a fresh-water pond is distinguished by its clavate tail and swelling in the middle of the oesophagus. Other typical brackish-water forms found are: Monhystera macramphis, M. elegantula, M. parva and Chromadora germanica. The male of Plectus sambesii is described and figured for the first time; P. paracommunis is recognized as a separate species. Dorylaimus intervallis is described and the vulvar region figured. R. W. Timm

790—ANDRÁSSY, I., 1959. [Institut für Tiersystematik der L. Eötvös-Universität, Budapest.] "Nematoden aus der Tropfsteinhöhle 'Baradla' bei Aggtelek (Ungarn), nebst einer Übersicht der bisher aus Höhlen bekannten freilebenden Nematoden-Arten. (Biospeologica Hungarica I)." Acta

Zoologica. Budapest, 4 (3/4), 253-277.

The nematode fauna of the stalactite cave "Baradla" at Aggtelek in Hungary was investigated and 17 species were encountered. Cylindrolaimus baradlanus n.sp. (female) and Dorylaimus bokeri n.sp. (male) are described and figured. The former is distinctive in its size and in the long cylindrical tail with tiny terminal gland orifice. The latter differs from D. carteri by its more offset head, longer spear, larger spicules and the arrangement of the pre-anal supplement. Andrássy comments on the feeding habits of the various species and enumerates the 97 different species of nematodes that have been described from caves the world over. Andrássy makes the following new combinations: Rhabditophanes schneideri (Bütschli, 1873) n.comb. [antedated by T. Goodey in 1953, for abstract see Helm. Abs., 22, No. 107g], Chiloplacus soosi (Andrássy, 1953) n.comb. from Acrobeles, Criconemoides stygia (W. Schneider, 1940) n.comb. from Criconema. I. B. Goodev

791—ANDRÁSSY, I., 1959. [Institut für Tiersystematik der L. Eötvös-Universität, Budapest.] "Weitere Nematoden aus der Tropfsteinhöhle 'Baradla'. (Biospeologica Hungarica V)." Acta Zoologica. Budapest, 5 (1/2), 1-6.

Andrássy [see also preceding abstract] has investigated further the nematode fauna of the stalactite cave "Baradla" in Hungary. He found eight nematodes of which Myolaimus amititiae n.sp. is described and figured for the first time. It has a longer stoma than other J. B. Goodey species, and the shape of the larva is characteristic.

792—ANDRÁSSY, I., 1959. [Egyetemi Állatrendszertani Intézet, Budapest, VIII. Puskin-u. 3, Ungarn.] "Neubenennungen einiger homonymen Nematoden-Gattungen." Nematologica, 4 (3), 223–226. [English summary p. 226.]

Andrássy renames three homonymic genera: Tobrilus nom.nov. for Trilobus Bastian, 1865 nec Trilobus Brünnich, 1781; Greenenema nom.nov. for Greenia Hoeppli & Chu, 1932 nec Greenia Kirby, 1896 et Greenia Oudemans, 1901, and Trachypleurosum nom.nov. for Trachypleura Thorne, 1939 nec Trachypleura Jaekel, 1900. 42 species of Tobrilus are renamed, I. B. Goodey one species of Greenenema and two species of Trachypleurosum.

793—ANDRÁSSY, I., 1959. [Institut für Tiersystematik der Universität, Budapest.] "Die Mundhöhlentypen der Mononchiden und der Schlüssel der Mylonchulus-Arten (Nematoda)." Opuscula Zoologica. Instituti Zoosystematici Universitatis Budapestinensis, 3 (1), 3–12.

A series of short descriptions, each with a figure, differentiates the eleven genera of Mononchidae [for abstract of Andrássy's treatment of the family see Helm. Abs., 27, No. 189a]. He gives a key for the separation of the 20 species of Mylonchulus of which only six species are known to I. B. Goodey have males.

794—ANDRÁSSY, I., 1959. [Institut für Tiersystematik der Universität, Budapest.] "Dorylaimus holdemani n.sp., eine neue Nematoden-Art aus Bulgarien." Opuscula Zoologica. Instituti Zoosystematici Universitatis Budapestinensis, 3 (1), 13–17.

Dorylaimus holdemani n.sp. (male and female) is described and figured. It is closest to D. alpinus, D. andrássyi and D. uniformis but has a large opening to the spear and a differently

shaped tail. It occurred associated with moss in Bulgaria.

795—ASADOV, S. M., 1958. [Nematodirus junctispicularis n.sp. from the small intestine of the wild goat, chamois and roe-deer.] Izvestiya Akademii Nauk Azerbaidzhanskoi SSR. Seriya Biologicheskikh i Selskokhozyaistvennikh Nauk, 1, 47-51. [In Russian.]

Asadov describes Nematodirus junctispicularis n.sp. (males only) from Capra cylindricornis, Rupicapra rupicapra and Capreolus capreolus in Azerbaidzhan. The new species is nearest to N. oiratianus and N. filicollis. Its principal differential character is the form of the spicules which coalesce at both their proximal and distal ends. The spicules are 0.671 to 0.854 mm. in length, the distal joined section 0.027 to 0.037 mm, and the lanceolate distinct tip 0.015 to 0.017 mm. The distal joined section is winged by a membrane. G. I. Pozniak

796—CABALLERO Y C., E., 1958. [Laboratorio de Helmintologia, Escuela Nacional de Ciencias Biológicas, I.P.N., Mexico, D. F.] "Estudios helmintológicos de la región oncocercosa de México y de la República de Guatemala. Nematoda. 10a parte." Anales de la Escuela Nacional de

Ciencias Biológicas. Mexico, 9 (1/4), 61-76. [English summary pp. 71-73.]

Caballero reports on the finding of one male and seven female specimens of Trichostrongylus chiapanensis n.sp. from the intestine of Sciurus deppei deppei in 1944. It was placed in Trichostrongylus on account of the form and structure of the copulatory bursa, the spicules and the female reproductive apparatus, but the new species differs from other members of the genus in the form and the structure of the spicules and the form of the gubernaculum. The former are similar in size and structure and well chitinized. Under the proximal extremity of each there is a concavity on the inner side and the distal parts of the latter terminate in a "V". The gubernaculum is chitinous and stiletiform. Other helminths found were: Trichuris sp. and Longistriata vexillata from Liomys pictus isthmicus; Gnathostoma spinigerum, Cruzia tentaculata and Physaloptera turgida from Didelphis marsupialis tabascensis; Ascaridia from Penelope purpurascens purpurascens; Physaloptera clausa from Urocyon cinereoargenteus guatemalae. N. Jones

797—CHABAUD, A. G., CAMPANA-ROUGET, Y. & BRYGOO, E. R., 1959. "Les nématodes Seuratoidea nov.sup.fam., et l'origine des Spirurida." Comptes Rendus des Séances de l'Académie des Sciences. Paris, 248 (9), 1449-1451.

Chabaud, Campana-Rouget & Brygoo introduce a new superfamily Seuratoidea (Nematoda: Ascaridina) for 17 genera which they interpret as linking the Ascaridina and the Spirurida. The superfamily is characterized by, among other characters, reduced or no lips and a short oesophagus either simple or divided into two parts. It contains one family, Seuratidae Hall,

1916 and six subfamilies: (i) Seuratinae with five genera, Seuratum, Skrjabinura, Seuratinema, (?) Denticulospirura and (?) Rictularina; (ii) Skrjabinelaziinae n.subf. with one genus Skrjabinelazia; (iii) Gendriinae n.subf. with three genera, Gendria, Paragendria and Buckleynema; (iv) Pinginae with three genera, Pingus, Cottocomephoronema and Haplonema; (v) Quimperiinae with four genera, Quimperia, Paraquimperia, Ichthyobronema and (?) Paraseuratum; (vi) Omeiinae with one genus, Omeia. W. G. Inglis

798—FASSULIOTIS, G. & WILLIAMSON, C. E., 1959. [Agricultural Research Service, U.S. Department of Agriculture, Beltsville, Maryland, U.S.A.] "Criconemoides axeste n.sp. associated with roses in commercial greenhouses in New York State." Nematologica, 4 (3), 205–210. [German

Criconemoides axeste n.sp. (male and female) is described and figured. The species occurred around the roots of roses in green-houses in New York State. The female has less annules (45) than any other previously described species. On the ventral side the second and third annules project anteriorly and all the annules have rough posterior edges. The posterior annule edges of the larva are "beaded". [The authors define "T" in a new way, as the distance from the tail tip (not cloaca) of the anterior extension of the testis expressed as a percentage of total body length, but set forth no arguments to support this departure.]

799—GOODEY, J. B., 1959. [Nematology Department, Rothamsted Experimental Station, Harpenden, U.K.] "Data to be considered, observed and, where possible, reported upon when presenting descriptions of new species." Nematologica, 4 (3), 211–216.
 The author suggests that adequate descriptions of new species (by present-day standards)

need the discussion of about 150 items of morphological detail accompanied by about nine separate figures. I. B. Goodev

800—GUPTA, S. P., 1959. "Nematode parasites of vertebrates of East Pakistan. III. Camallanidae

from fish, amphibia, and reptiles." Canadian Journal of Zoology, 37 (5), 771-779. Gupta describes two new species of the genus Camallanus from frogs, a new species of Procamallanus from a catfish, all from Dacca, East Pakistan, and a member of the genus Camallanides from a sea-snake from Derma, East Pakistan. All the worms were located in the small intestine of their hosts. He also provides a key to eleven species of the genus Gamallanus reported from reptiles and amphibians, viz., C. thapari n.sp., C. nodulosus n.sp., C. nigrescens (von Linstow, 1906), C. baylisi Karve, 1930, C. ranae Khera, 1954, C. multilineatus Kung, 1948, C. microcephalus (Dujardin, 1845), C. multiruga Walton, 1932, C. pipientis Walton, 1935, C. mazabukae Kung, 1948, C. kaapstadi Southwell & Kirschner, 1937. Camallanus nodulosus n.sp. from Rana cyanophlyctis is distinguished from other members of the genus in amphibian and reptilian hosts except C. thapari q.v., by the presence of noded ridges in the buccal capsule; it can be distinguished from those members of the genus in fishes which have noded ridges in the buccal capsule by the smaller number of its pre- and post-cloacal papillae. Camallanus thapari n.sp. from Rana tigrina resembles C. nodulosus in having noded ridges in the buccal capsule but differs from it in the number and arrangement of the genital papillae of the male, i.e. six pre-anal and five post-anal pairs in C. thapari, seven and six respectively in C. nodulosus. Procamallanus dacca n.sp. from an unidentified catfish has a smooth buccal capsule with no transverse or spiral thickenings; an accessory piece; a right spicule only; seven to eight pre-anal, one ad-anal, and nine post-anal papillae in the male; the vulva behind the mid-region of the body and two cuticular processes at the posterior extremity of the tail in the female. These features serve to distinguish it from other known members of the genus. One female specimen only of Camallanides sp. from Hydrophis cyunocinctus is described. It closely resembled C. prashadi but differs by being smaller and having a more anteriorly placed W. M. Fitzsimmons vulva and in the position of the vagina.

801—HSÜ, S. T., LING, M. T. & LIANG, C. S., 1957. [North-Western Veterinary College, China.] [Two new species of Ostertagia (Nematoda: Trichostrongylidae) from sheep of Kansu Province, north-western China.] Acta Veterinaria et Zootechnica Sinica, 2 (1), 1–6. [In Chinese: English summary p. 6.]

Two new species of Ostertagia from sheep, Ovis aries, are described. Ostertagia (Ostertagia) erschowi n.sp. resembles O. trifurcata, but differs in being larger and in that the distance

from the tip of the lateral spike to the main spike of the spicule is relatively short, in having a tadpole-shaped gubernaculum and a genital cone of different structure, in that the medio-lateral rays are much greater than the postero-lateral rays and the dorsal ray is much longer; in the female there is a prominent vulval flap, the distance from the vulva to the caudal extremity is greater and the tail is less pointed. O. (O.) hsiungi n.sp., resembles O. buriatica, but differs from the latter not only in being larger but also in the shape of the spicules, the shape and size of the gubernaculum, the shape of the genital cone, and the size of the external dorsal rays. The female worm is not described.

L. S. Yeh

802—KLOSS, G. R., 1958. "Nematódeos de invertebrados." Anais da Academia Brasileira de Ciencias, 30 (1), 107-110.

Kloss, continuing his series of reports on the nematode parasites of invertebrates, describes a new species of Zonothrix and the male of Galebiella toddi (Travassos, 1954) from hydrophilid beetles near Rio de Janeiro, Brazil. Zonothrix adversa n.sp. is described as resembling closely Z. tropisterna Todd, 1942 and is differentiated from that species by the greater proximity of the vulva to the anus in the female and by the greater length of the oesophagus and number of anal papillae in the male. The host is Tropisternus collaris Fabr. The males of Galebiella toddi were obtained from the intestines of Hydrous ater Olivier. They are readily distinguished from the males of Pseudonymus vazi Travassos, 1954 by the fact that in G. toddi the first part of the tail is longer than the second.

803—K'UNG, F. Y., 1958. [Peking Agricultural College.] [Triodontophorus hsiungi n.sp., a new nematode parasite of donkeys.] Acta Veterinaria et Zootechnica Sinica, 3 (1), 14–18. [In Chinese: English summary p. 16.]

Triodontophorus hsiungi n.sp. is described from the large intestine of donkeys (Equus asinus) in Peking. The new species resembles T. minor and T. brevicauda in having a bursa with a long dorsal lobe, but resembles T. minor more closely. It can be differentiated from T. minor by its teeth which have a central projection and three pairs of lateral projections as compared to the simple bifid teeth of T. minor. The spicules are relatively short, measuring only 0.86 to 0.95 mm.

L. S. Yeh

804—LORDELLO, L. G. E., 1958. [Escola Superior de Agricultura Luiz de Queiroz, Universidade de São Paulo, Piracicaba, São Paulo.] "Nota sôbre o gênero Mononchus de nematódeos predadores." Anais da Escola Superior de Agricultura "Luiz de Queiroz". Piracicaba, 14-15, 119-124. [English summary p. 123.]

Mononchus jairi n.sp. is described and figured. It is smaller than M. monhystera, its lip region is more expanded and offset and the anterior sclerotization of the pharynx is turned somewhat outwards. Lordello notes the transfer by Andrássy of seven species of Mononchus found in Brazil into other genera [for abstract see Helm. Abs., 27, No. 189a]. He also points out that Iotonchus carvalhoi Andrássy, 1958 is a synonym of I. risoceiae (Carvalho, 1955) Andrássy, 1958.

J. B. Goodey

805—LORDELLO, L. G. E. & ZAMITH, A. P. L., 1958. [Escola Superior de Agricultura Luiz de Queiroz, Universidade de São Paulo, Piracicaba, São Paulo.] "Nota sôbre o gênero *Trichodorus* Cobb, 1913, com descrição de *Trichodorus bucrius* sp.n. (Nematoda, Dorylaimoidea)." Anais da Academia Brasileira de Ciencias, 30 (1), 103–105. [English summary p. 105.]

Trichodorus bucrius n.sp. is described and figured. It is characterized by an expanded offset lip region, two pores anterior and two posterior to the vulva in the ventral position and a slight overlap of the oesophagus by the intestine. [The second and third characters and the spear length suggest a very close affinity with T. porosus Allen, 1957.]

J. B. Goodey

806—MACKERRAS, M. J., 1959. [Queensland Institute of Medical Research, Brisbane, Australia.] "Strongyloides and Parastrongyloides (Nematoda: Rhabdiasoidea) in Australian marsupials." Australian Journal of Zoology, 7 (2), 87-104.

Mackerras records Strongyloides thylacis n.sp. from Thylacis obesulus (Shaw), Parastrongyloides trichosuri n.sp. from Trichosurus vulpecula (Kerr) and P. peramelis n.sp. from Thylacis obesulus and Perameles nasuta Geoffroy. The development and morphology of the parasitic and free-living generations is given for each species. The principal differences between the three

species described are given. The size of the parasitic adults and the absence of males in S. thylacis, are the most useful characters for quick identification. The parasitic males measure 0.78-1.30 mm. in length in P. peramelis, and 3.0-4.0 mm. in P. trichosuri. Parasitic females measure 2.25-3.82 mm. in length in S. thylacis and 1.13-1.98 mm. and 4.2-5.2 mm. respectively in P. peramelis and P. trichosuri. Small differences only were found between the free-living adults, and none between their larvae although the infective filariform larvae of P. peramelis and P. trichosuri tended to be longer than those of S. thylacis. The two Australian species of Parastrongyloides can be distinguished from the genotype and only other described species, P. winchesi from the European mole and shrew, by the shape of the tail in the parasitic males. It is bluntly rounded, with or without a minute spine, in the Australian species, finger-like in P. winchesi. Mackerras believes that the genera Strongyloides and Parastrongyloides are not adequately distinguished on morphological grounds—their separation depends essentially on a biological character, the presence or absence of males in the parasitic generation. S. thylacis and P. trichosuri both exhibited a regular alternation of generations. P. peramelis exhibited an alternation of generations but homogonic development sometimes occurred as R. V. Brunsdon

807—SAUER, M. R., 1958. [Commonwealth Research Station, Merbein.] "Two new species of *Hemicycliophora* (Nematoda: Tylenchida)." **Proceedings of the Linnean Society of New South Wales, 83** (2), 217–221.

Sauer agrees with Chitwood & Birchfield [for abstract see Helm. Abs., 26, No. 136q] in opposing the characterization of *Hemicycliophora* as having 200 or more annules. *H. tesselata* n.sp. is described and figured. The female has about 150 annules, each divided longitudinally by 20 grooves and has a sheath that usually stands up around the head. The male has no sheath or spear, has very curved spicules, a longish conical tail, and a prominent bursa. *H. brevicauda* n.sp. is also described and figured. The female has about 150 plain annules, a very short hemispherical tail and a vulva near to its posterior end. The male is similar to that of *H. tesselata* but has a short pointed tail set off by a constriction where the bursa ends. The first species occurred in soil beneath *Eucalyptus incrassata*, the second beneath *Codonocarpus cotinifolius* in Victoria, Australia.

J. B. Goodey

808—SAUNDERS, L. Z., 1959. [School of Veterinary Medicine, University of Penpsylvania, Philadelphia, U.S.A.] "On Yeh's revision of the nematode genus *Setaria*." [Correspondence.] **Veterinary Record, 71** (30), 631–632.

Saunders criticizes adversely Yeh's comments on the role of *Setaria* spp. (Nematoda) in cerebrospinal nematodiasis. It is pointed out that Yeh has not fully appreciated the evidence in support of the role of such species and that some of his references are either unfortunate choices or simply incorrect. The author finally points out that cerebrospinal nematodiriasis [sic] may occur in epizootic proportions, it is an aetiologic neuropathologic entity with a stereotyped and distinctive histopathologic picture, is caused by nematodes of the genus Setaria (Artionema Yeh) and that all these facts were discovered by Japanese veterinarians. [See also No. 816 below.]

809—SCHAD, G. A., 1959. [Institute of Parasitology, McGill University, Macdonald College P.O., Quebec, Canada.] "A revision of the North American species of the genus Skrjabinema (Nematoda: Oxyuroidea)." Proceedings of the Helminthological Society of Washington, 26 (2), 138–147. Schad revises the species of Skrjabinema Vereshchagin, 1926 (Nematoda) occurring in North American hosts, and gives a key to the four species recognized. These are: S. ovis (Skryabin, 1915) with S. oreamni as a synonym (in part); S. tarandi Skryabin & Mitskevich, 1930 (=S. oreamni Swales, 1934 in part); S. parva Dikmans, 1942 and S. caprae n.sp. The new species closely resembles S. ovis but differs in there being only one sub-interlabial projection in the male (none in S. ovis), and in the lateral alae on the female tail extending for a shorter distance along the tail. The subgenera Skrjabinema and Chylocrypta Mönnig, 1932 are not accepted and it is suggested that S. alata and S. africana, both Mönnig, 1932, are probably indistinguishable from S. ovis. It is reported that there is a nocturnal periodicity in the migration of mature females to the rectum in goats (S. caprae) but not in S. ovis (in sheep).

810—SIDDIQI, M. R., 1959. [Department of Zoology, Aligarh Muslim University, Aligarh, (U.P.), India.] "Basiria graminophila n.g., n.sp., (Nematoda: Tylenchinae) found associated with grass roots in Aligarh, India." Nematologica, 4 (3), 217–222. [German summary p. 222.]

roots in Aligarh, India." Nematologica, 4 (3), 217–222. [German summary p. 222.] Basiria graminophila n.g., n.sp., (male and female) found associated with the roots of grasses at Aligarh, India, is described and figured. It is closest to Psilenchus but differs chiefly in that the opening of the dorsal oesophageal gland duct is about a spear-length behind the spear base.

J. B. Goodey

811—THÉODORIDÈS, J., 1958. [Laboratoire d'Evolution des Etres Organisés, Faculté des Sciences de Paris.] "Artigasia pauliani Théodoridès 1955 var. joliveti nov. (Nematoda Oxyuroidea Thelastomatidae) parasite d'un coléoptère passalide." Exploration du Parc National Albert. Brussels,

Deuxième série, No. 6, pp. 21–25. Théodoridès describes and figures as Artigasia paulini var. joliveti n.var., oxyurids collected from the hind-gut of Erionomus planiceps in the Belgian Congo. All the specimens were adult females. The characters which distinguish the new variety from A. pauliani are the size of the cuticular spines $(12 \times 7\mu)$ in the typical form, $5 \times 4\mu$ in the new), the distance from the excretory pore to the anterior end $(413-450\mu)$ in the typical form, $600-660\mu$ in the new) and the distance between the vulva and the anus (500μ) in the typical form and $800-900\mu$ in the new variety).

812—TIMM, R. W., 1959. [Nôtre Dame College, Dacca 2, East Pakistan.] "New marine nematodes of the superfamily *Enoploides* from the Arabian Sea." **Journal of the Bombay Natural History Society, 56** (2), 204–210.

Four new species from the Arabian Sea at Karachi, West Pakistan, are described and figured. *Enoplus mammillatus* n.sp. is characterized by a mammilate supplement just behind the anus of the male. *Thoracostoma karachiense* n.sp. is distinguished from *T. magnificum* by the pattern of papillae of the male tail and a group of four sub-cephalic setae immediately behind the amphids in both sexes. *Leptosomatides reducta* n.sp. has a reduced head capsule and short crura of the gubernaculum. *Pontonema multisetosus* n.sp. is differentiated from all other species by the presence of 12 cephalic setae and three pre-anal male supplements.

R. W. Timm

813—TIMM, R. W., 1959. [Nôtre Dame College, Dacca 2, East Pakistan.] "Cheilorhabditis and Odontorhabditis, two new genera of soil nematodes allied to Rhabditis." Nematologica, 4 (3), 198–204. [French summary p. 204.]

Cheilorhabditis dacchensis n.g., n.sp. and Odontorhabditis musicola n.g., n.sp. are described and figured. Both occurred in rotting underground parts of banana in Dacca. The former has cheilorhabdions curved as a question mark, and a large dorsal tooth on the dorsal metarhabdion. In the latter the cheilorhabions are neither sclerotized nor curved, the stoma is proportionately wider, the dorsal tooth is more anteriorly placed and the ventral metastom wall is concavely widened opposite the tooth. Both genera have bursate males with bursal papillae in a typical rhabditoid arrangement and females with paired ovaries.

J. B. Goodey

814-WIESER, W., 1959. "Free-living nematodes and other small invertebrates of Puget Sound beaches." University of Washington Publications in Biology, 19, x+179 pp. In the taxonomic section Wieser presents the following new genera: Hyalacanthion (similar to Enoploides but shorter spicules and middle portion of mandibles consisting of a thin, transparent lamella) with H. multipapillatum n.sp. (type), H. pellucidus n.comb. for E. pellucidus Savelev and H. murmanicus n.comb. for E. murmanicus Savelev, and Parascolaimus (six labial "claws" or modified papillae and peculiar two-part gubernaculum) with P. tau n.sp. (type) and P. ungulatus n.sp. Keys are given to the species of Mesacanthion, Trileptium, Pareurystomina, Graphonema, Atrochromadora, Axonolaimus, Odontophora (partial), Filipjevinema, Cobbia and Theristus. The following new species are described; the chief characters on which differentiation from other species is based are given in parentheses: Lauratonema mentulatum (stoma, length, cephalic setae, spicules and tail); L. pugiunculus (gubernaculum, tail, spicules, excretory gland and pore); Rhabdodemania illgi (cephalic setae); Enoplus velatus (spicules, tail); Oxyonchus culcitatus (cephalic setae, stoma); Enoplolaimus lenunculus (cephalic setae, spicules); E. paralitoralis (setae); Mesacanthion pali; M. arcuatilis; M. pannosum; M. cricetoides; Mesacanthoides sinuosus (gubernaculum); Enoploides harpax (spicules); Trileptium iacobinum, Oncholaimus martini (tail and setae); O. apostematus (tail and setae); Oncholaimium vesicarium (tail and setae); Metoncholaimus uvifer (spicules, tail, gubernaculum); Viscosia tumidula (stoma, tail, setae); Eurystomina repanda (setae, spicules); Pareurystomina pugetensis, Symplocostoma dissoluta (stoma, setae, excretory pore and duct); Calyptronema pachyderma (setae, excretory pore); Pomponema segregata (setae, spicules, tail); Biarmifer gibber (setae, gubernaculum); Choniolaimus macrodentatus (teeth, setae, papillae); Cyatholaimus dentatus (tooth, setae, genital armature); Paracanthonchus quinquepapillatus (pre-anal tubuli); P. mutatus (genital armature); P. serratus (gubernaculum); Acanthonchus (Seuratiella) rostratus (setae, excretory pore, tubuli); A. (A.) duplicatus (amphids, tubuli); Latronema sertata (amphids, spicules, tail); Ceramonema carinatum (setae); Chromaspirina spinulosa (amphids, setae); Onyx rugata (supplements); Nudora armillata (number of "wings"); Microlaimus cochleatus (setae, spicules); M. dixiei (gubernaculum, setae); Paramicrolaimus spirulifer (setae); Graphonema flaccida; G. clivosa; Neochromadora pugilator (setae, spicules); H. appiana (setae, spicules); N. bicoronata (setae); Chromadora undecimpapillata (pre-anal papillae); Prochromadorella triangularis (spicules, pre-anal papillae); Chromadorella galeata (width); C. edmondsoni (lateral differentiation, pre-anal papillae); Atrochromadora obscura; Axonolaimus interrogativus; Odontophora lituifera; O. mercurialis; O. mucronata; Araeolaimus boomerangifer (setae, spicules); Araeolaimoides botulus (setae, excretory pore); Bathylaimus bicoronatus (setae); B. tarsioides (setae); Tripyloides imitans (tail, papillae); Filipjevinema doliolum; Linhomoeus undulatus (setae, tail, spicules); Sphaerolaimus penicillus var. pugetensis n.var. (spicules); Cobbia truncata; C. urinator; Steineria phimifera (setae, spicules); S. gerlachi (setae, spicules, tail); Theristus (T.) wimmeri (spicules); T. (Daptonema) uncinatus; T. (D.) sinuosus (setae and amphids); T. (Mesotheristus) circumscriptus (gubernaculum); T. (Cylindrotheristus) ecphygmaticus (spicules, papillae); T. (C.) resimus (gubernaculum, amphids); T. (C.) trecuspidatus (setae, genital apparatus). Other taxonomic changes are as follows: Mesacanthoides caput-medusae (Ditlevsen) n.comb. for Enoplolaimus caput-medusae; Harveyiohnstonia Mawson, 1953, as a synonym of Paracanthonchus; Graphonema tentabunda (de Man) n.comb. for Spilophora tentabunda; G. chitwoodi (Wieser) n.comb. for Chromadorita chitwoodi; Atrochromadora nom.nov. for Chromadoropsis (Wieser nec Filipev); Theristus (Pseudosteineria) scopae (Gerlach) n.comb. for Steineria scopae; T. (P.) metacoronatus nom.nov. for T. coronatus Gerlach nec Stekhoven. In the ecological section Wieser groups the various small invertebrates of five Puget Sound beaches according to habitat and intertidal height. The meiofauna predominantly consists of euryhaline marine animals. R. W. Timm

815—YANG, P. & WEI, T., 1957. [North-Western Veterinary College, China.] [Studies on cattle Thelazia (Nematoda: Thelaziidae) from Kansu, China, including descriptions of three new species.] Acta Veterinaria et Zootechnica Sinica, 2 (1), 7-14. [In Chinese: English summary p. 13.] This paper deals with four species of Thelazia from the eyelids of cattle, Bos taurus, in China, namely, Thelazia rhodesii, T. (Thelazia) kansuensis n.sp., T. (T.) brevispiculata n.sp., and T. (Thelaziella) hsui n.sp. T. rhodesii is redescribed. T. kansuensis has a curved male tail with spicules measuring 0·1 mm. to 0·14 mm. and 0·7 mm. to 0·78 mm. and differs from T. rhodesii in having only twelve pairs of pre-anal and two pairs of post-anal papillae. T. brevispiculata described from one male specimen only. It resembles T. rhodesii in having a straight male tail, but differs in having 13 pairs of pre-anal and two pairs of post-anal papillae. The spicules measure 0·1 mm. and 0·17 mm. T. hsui has spicules measuring 0·67 mm. and 0·71 mm. It differs from T. lachrymalis in the host and in the prominent transverse cuticular striations. With the exception of T. rhodesii, the three new species can be distinguished from other bovine Thelazia by their prominent cuticular striations

816—YEH, L. S., 1959. [Department of Parasitology, London School of Hygiene & Tropical Medicine, London, W.C.1.] "Revision of the nematode genus Setaria." [Correspondence.] Veterinary Record, 71 (35), 751–752.

Yeh replies briefly to Saunders' criticism of his revision of the genus Setaria [see abstract No. 808]. Saunders is on unfirm ground in discussing the paper and refers to "cerebrospinal nematodiriasis" (due to the intestinal Nematodirus).

S. Willmott

Nematomorpha

No relevant abstracts in this issue

Hirudinea

No relevant abstracts in this issue

Pentastomida

No relevant abstracts in this issue

Miscellaneous

817—FRITTS, D. H., 1959. [Montana Veterinary Research Laboratory, Montana State College, Bozeman, Montana, U.S.A.] "Helminth parasites of the fishes of northern Idaho." Transactions of the American Microscopical Society, 78 (2), 194–202.

Of the 20 species of helminth parasites recovered from 14 species of fresh-water fishes, three are regarded as being new to science. The digenean Plagiocirrus testeus n.sp. from Catostomus macrocheilus is considered to differ from P. primus in being slightly larger, measuring 2.0 to 2.9 mm. in length and 0.57 to 0.68 mm. in breadth. The intestine in P. testeus bifurcates in front of the ventral sucker and not at its anterior margin as in P. primus. The ovary in P. testeus is dextral and is situated immediately in front of the anterior testis while in P. primus it is dextral and midway between the ventral sucker and the anterior testis. The testes in P. testeus are lobed and slightly oblique or arranged in tandem fashion while they are round and slightly oblique in P. primus. Two species of cestodes of the genus Corallobothrium, namely C. intermedium n.sp. and C. minutium n.sp., both from Ameiurus nebulosus, are distinguished from each other and from other species by a number of characters which are listed in the table. C. intermedium measures 1.0 to 1.5 cm. in length, consisting of 12-20 proglottides: the testes number 42-50 per mature proglottis and there are usually six uterine folds present. A mature specimen of C. minutium measures 15 to 26 mm. in length and consists of 24-40 proglottides which when ripe are 0.56-1.3 mm. long by 0.4-0.6 mm. wide. The scolex has a diameter of 0.66-0.83 mm.; the testes number 42 to 60 in a mature segment and the uterine folds vary from six to eight on the poral side and from seven to nine on the aporal side. I. L. Owen

818—GVOZDEV, E. V., 1956. [Parasitic worms of Coturnix coturnix from the vicinity of Alma-Ata.] Trudi Instituta Zoologii. Akademiya Nauk Kazakhskoi SSR., 5, 77–83. [In Russian.] Gvozdev has examined, over a period of five years, 115 Coturnix coturnix from the Alma-Ata area. He found 17 species of helminths, eight of which—Postharmostomum gallinum, Philophthalmus coturnicola, Skrjabinus aenigma n.sp., Raillietina (Fuhrmanetta) pluriuncinata, Ascaridia compar, Subulura skrjabini, Cheilospirura gruveli—were new for this host in the U.S.S.R., bringing the list of species known for Russia up to 30. The four last-named species, Rhabdometra nigropunctata and Choanotaenia infundibulum are pathologically important. The new species S. aenigma was found in the gall-bladder and is differentiated from other species in the genus by the measurements and relative positions of the sex organs and by the equally sized suckers. In S. lanciformis, the species nearest to S. aenigma, the ovary lies on the left of the midline of the body and in S. aenigma on the right. [This paper was mentioned by title only in Helm. Abs., 25, No. 865c.]

819—GVOZDEV, E. V., 1956. [The helminth fauna of Ochotona spp. of Kazakhstan.] Trudi Instituta Zoologii. Akademiya Nauk Kazakhskoi SSR., 5, 98-104. [In Russian.] The helminths found in Ochotona alpina (collected in 1947) and O. pricei (collected in 1953) in Kazakhstan, were Schizorchis altaica, Cephaluris andrejevi, Dermatoxys schumakovitschi and, in O. pricei only, Labiostomum vesicularis n.sp. This new nematode differs from L. naimi chiefly by the absence of spicules, the position of anal papillae of which there are two pre-anal,

one para-anal and three post-anal pairs, and the vesicle-like inflation of the cuticle around the head. The diagnosis of *Labiostomum* is emended to include species without spicules. A table lists the eight helminths known from *Ochotona* with the country of their occurrence. [This paper was mentioned by title only in Helm. Abs., 25, No. 865d.]

G. I. Pozniak

820-MARKOV, G. S. & PARASKIV, K. P., 1956. [The helminth fauna of reptiles in Kazakhstan.] Trudi Instituta Zoologii. Akademiya Nauk Kazakhskoi SSR., 5, 120-128. [In Russian.] An examination of ten species of reptiles in Kazakhstan revealed 12 species of helminths. Trematodes were absent. The following were new host records: Centrorhynchus sp. in Teratoscincus scincus, Phrynocephalus mystaceus, Eremias arguta and E. grammica; Oligacanthorhynchus sp. in Ancistrodon halys; Tetrathyridium sp. and Spirocerca lupi in Vipera lebetina; Pharyngodon spinicauda in Gymnodactylus fedtschenkoi; P. tectipenis in E. grammica and E. velox (this species is also new for Russia); Oochoristica sobolevi in E. velox; O. tuberculata and Abbreviata (A.) uzbekistanica in Teratoscincus scincus; and A. (A.) turkomanica in Agama sanguinolenta and Phrynocephalus mystaceus. The authors define the characters which should be used for the differentiation of species in the subgenus Abbreviata and describe A. kazachstanica n.sp. from Ophisaurus apodus, differentiating it from nine species of the subgenus. Its principal characters are: females 20-31 mm. and males 9·1-18 mm. long, oesophagus 4.01 mm. and 2.79 mm. long respectively, female tail 0.6 mm., uterus dichotomous, large spicule 2.6-4.0 mm. long, three sessile post-cloacal papillae, two pairs of pedunculate papillae in front of and two pairs behind the cloaca, the cuticular vesicle in the male lancet-shaped with ventral protuberances which form a characteristic pattern and eggs 0.061×0.042 mm. The twelfth species, Oochoristica truncata, was found in Agama sanguinolenta. G. I. Pozniak

821—McKNIGHT, T. J., 1959. [University of Oklahoma, U.S.A.] "A taxonomic study of the helminth parasites of the turtles of Lake Texoma." **Dissertation Abstracts**, 20 (3), 1106.

McKnight recovered three species of Cestoidea, 16 species of Trematoda and eight species of Nematoda from the turtles Trionyx ferox emoryi, T. spinifera, Pseudemys scripta elegans, Graptemys pseudogeographica, Kinosternon subrubrum and Chelydra serpentina in Lake Texoma and its Washington tributaries. First reports include: Cylindrotaenia americana from T. spinifera and T. ferox emoryi; Proteocephalus testudo from P. scripta elegans and G. pseudogeographica; Crepidostomum cooperi from Chelydra serpentina; Oxysomatium variabilis from T. spinifera and G. pseudogeographica. Cephalagonimus vescaudus occurred most widely of the trematodes, and Camallanus trispinosus and Spiroxys contorta of the nematodes. Low incidence and intensity of trematode infections was probably due to small populations of arthropodan and molluscan intermediate hosts in the lake. Turtles which were inactive due to low temperatures harboured no cestodes.

J. M. Watson

822—PANIN, V. Y., 1956. [The helminth fauna of rodents in West Kazakhstan.] Trudi Instituta Zoologii. Akademiya Nauk Kazakhskoi SSR., 5, 84–97. [In Russian.]

Panin lists one trematode, eight cestode, nine nematode and one acanthocephalan species for rodents in West Kazakhstan. The data are based on his own examinations of 530 animals (13 species) and on records in the literature. The helminths include (i) Plagiorchis phokeewi n.sp., from the intestine of Mus musculus, which is described and figured but no differential diagnosis is given, and (ii) Rictularia kazachstanika n.sp., from the intestine of Meriones tamariscinus, Mus musculus and Citellus pygmaeus, which differs from the known species of the genus by its large size (45–60 mm.), the dorsal position of the mouth capsule with 26 teeth on its inner edge, the number of combs on the body (70 pairs in the male and over 41 pairs in the female) and the size of the spicules (0.069 × 0.009 mm.). Catenotaenia sp. is reported for the first time from Alectagulus acontion. The parasites are also listed under hosts and various aspects of the fauna are discussed.

G. I. Pozniak

INVERTEBRATE INTERMEDIATE HOSTS

Arthropoda

See also Nos.: 480, 488, 489, 500, 505, 506, 512, 515, 517, 519, 523, 525, 552, 782, 786, 903, 904, 905, 910, 912, 913, 914.

823—ANON., 1959. "Surveys on the wintering of *Culex pipiens* var. pallens and the use of 666 smoke against wintering mosquitoes in Chining area, Shantung Province." [Abstract.] Chinese Medical Journal. Peking, 78 (2), 180.

The mosquitoes were found hibernating mainly in vegetable cellars and irrigation wells. They showed no natural infection of filarial larvae. 25 gm. 666 smoke (containing $1\cdot14$ gm. to $2\cdot03$ gm. of γ -isomers) were used at each site. In cellars most mosquitoes were narcotized half an hour later and all were dead 17 hours later. In wells they were dead or narcotized within four hours. Fumigated areas checked four to ten days later contained only dead mosquitoes.

N. A. Hancock

824—BRANGHAM, A. N., 1958. "Notes myrmécologiques sur les fourmis et la 'petite douve' (*Dicrocoelium lanceolatum* Rudolphi)." Entomologiste. Paris, 14 (5/6), 106–119.

Brangham comments on the paucity of information relating to ants as possible second intermediate hosts of Dicrocoelium lanceolatum (syn. D. dendriticum Rudolphi, 1819), and briefly reviews the life-cycle of the trematode. The ant species that have been reported as hosts in Europe are discussed in terms of their contemporary nomenclature, distribution and habits, in so far as they affect the trematode. Although all are species of the genus Formica L. there seems to be no basic reason for this genus to play the role of second intermediate host exclusively. The life-cycle of two parasitic ant species, F. sanguinea Latr. and Polyergus rufescens Latr. is considered at length, since by virtue of their dependence on other ant species, it appears theoretically possible for a second ant species to be involved at the second intermediate host stage of the trematode's development. For this possibility, the name "deuxième hôte intermédiaire auxiliaire" (auxiliary second intermediate host) is suggested. Reference is made to the fact that one group of authorities believes the role of ants as second intermediate hosts to be obligatory, and the other as only facultative. A table showing the pattern of myrmecine dulosis of the genus Formica is given, as well as one outlining the distribution in France of the species of this genus. A. N. Brangham

825—BRANGHAM, A. N., 1959. [Leaf Cottage, Possingworth Park, Cross-in-hand, East Sussex, U.K.]
"Ant vectors in the life-cycle of the lesser liver fluke, *Dicrocoelium dendriticum* (Rudolphi 1819)
(Trematoda: Dicrocoeliidae)." Entomologist's Gazette. London, 10 (3), 111–131.

Present information about ant vectors in the life-cycle of the helminth genus Raillietina is briefly reviewed. The life-cycle of the lesser liver-fluke, Dicrocoelium dendriticum Rudolphi, 1819 is described. Its evolution to maturity through its intermediate hosts, snails and ants, before reaching its definitive host, usually a sheep, is discussed, with particular reference to the doubt that exists that ants are, in fact, obligatory second intermediate hosts. It is suggested that further rigorously controlled experiments may favour the view that ants are necessary vectors. An outline of ant parasitism, in so far as this phenomenon is found among British species of the genus Formica, is given and the theoretical possibility that a second species of ant might be concerned as second intermediate host to D. dendriticum is elaborated. A table of British ants of the genus Formica that are temporary social parasites on account of their inability to found nests independently is given, together with the host species of ant. The view is offered that, under such circumstances, a host species of ant may infect a parasite species of ant in the same colony with the cercariae of D. dendriticum, and it is suggested that the second species acting in this capacity be called the auxiliary second intermediate host species. Brief notes on the distribution in Britain of D. dendriticum and of the ants that may be concerned as second intermediate hosts and auxiliary second intermediate hosts are given. The recent revisions in the nomenclature of British ants belonging to the rufa and fusca groups of the genus Formica, by Yarrow, are incorporated with the discussion on the British species concerned potentially with the life-cycle of the lesser liver-fluke. A. N. Brangham 826-GRENIER, P. & MOUCHET, J., 1959. [Laboratoire d'Entomologie médicale, Institut Pasteur, Paris.] "Note complémentaire sur la morphologie et la biologie de S. ovazzae Grenier et Mouchet, 1959 (Diptera, Simuliidae), espèce associée au crabe *Potamonautes chaperi M.*-Edw., dans L'Ouest africain." **Bulletin de la Société de Pathologie Exotique, 52** (3), 373–385.

Grenier & Mouchet describe in detail the adult male, adult female, nymph and larva of their new species of Simulium-S. ovazzae n.sp.-which belongs to the S. neavei complex. The immature stages are associated with the crab Potamonautes chaperi. The feeding habits of the adults of the new species have yet to be determined. Should it prove that they are anthropophilous and can act as vectors of onchocerciasis, the struggle to control this infection will be complicated in the areas where the new species occurs. I. M. Watson

827—KUNG, C. C., LANG, S., HSÜ, A. N., CHANG, C. L. & WU, P. Y., 1959. [Military Academy of Medical Sciences.] "Epidemiologic studies of filariasis in Chentse hsien, Kiangsu Province. II. Studies of mosquito vectors with special reference to transmission of filariasis by Anopheles hyrcanus

var. sinensis." [Abstract.] Chinese Medical Journal. Peking, 78 (2), 178.

Of 17 species of mosquitoes found, Culex pipiens var. pallens and Anopheles hyrcanus var. sinensis were the commonest, and of the latter, most were of the A. sinensis form. 12% of the C. pipiens var. pallens and 9.2% of the A. hyrcanus var. sinensis were positive for Wuchereria bancrofti larvae (all stages); of these, 1.3% and 0.24% respectively had infective larvae. 6.43% of the anophelines had all stages of malayan larvae, with 0.54% carrying the infective form, but none of the culicines were positive. Experimental infection of the anophelines with Mf. malayi showed an infection rate of 7.83% in the A. sinensis form and 7.5% in the A. lesteri form. In a similar experiment with bancroftian larvae, 54.1% culicines, 7.14% A. sinensis form and 33.3% A. lesteri form were positive for infection. However, development was retarded in the anophelines. The A. sinensis form is considered the main vector of malayan filariasis, and both culicines and anophelines as good bancroftian vectors.

828—LU, H. C., MA, T. C. & LI, C. P., 1959. [Institute of Parasitic Diseases, Chinese Academy of Medical Sciences.] "The blood preference of some culicine mosquitoes in rural areas of Nanking." [Abstract.] Chinese Medical Journal. Peking, 78 (2), 180.
Determination was by the blood precipitin test. 92% of Culex pipiens var. pallens contained

human blood, the remainder having the blood of various domestic animals. Of C. tritaeniorhynchus, 46·3% had cow blood, 43·5% had horse blood, and 8·6% human blood. Armigeres N. A. Hancock obturans prefers cow to human blood.

829-LU, H. C. & YÜ, Y., 1959. [Institute of Parasitic Diseases, Chinese Academy of Medical Sciences.] "Observations on resting places and activities of *Culex pipiens* var. pallens Coq. in Southern Shantung Province." [Abstract.] Chinese Medical Journal. Peking, 78 (2), 181.

Inside houses, moist and dark places, underneath furniture, or on hanging objects were the main resting places of Culex pipiens var. pallens, vector of filariasis in South Shantung. Outdoors the mosquitoes were found mainly in wells and cellars. The peaks of activity were 30-90 minutes after sunset and 60 minutes after sunrise. N. A. Hancock

830—MULLEE, M. T. & VOGE, M., 1959. [Department of Infectious Diseases, School of Medicine, University of California, Los Angeles, U.S.A.] "Oryzaephilus surinamensis (L.): a new intermediate host for the cestode Hymenolepis diminuta." Journal of Parasitology, 45 (5), 504.

Mullee & Voge successfully infected the saw-toothed grain beetle, Oryzaephilus surinamensis, with eggs of Hymenolepis diminuta, and obtained cysticercoids which were infective to rats. Attempts to infect these beetles with H. nana were unsuccessful except for the recovery of one abnormal cysticercoid. All attempts to infect the drug-store beetle, Segobium panaceum, with H. diminuta and H. nana were unsuccessful. I. M. Watson

831—NELSON, G. S., 1959. [Division of Insect Borne Diseases, Medical Research Laboratory, Kenya.] "The identification of infective filarial larvae in mosquitoes: with a note on the species found in

'wild' mosquitoes on the Kenya coast." **Journal of Helminthology, 33** (2/3), 233–256. **Nelson** describes a "reference collection" of infective filaria larvae by which infective larvae dissected from "wild" caught mosquitoes can be identified. The infective larvae were dissected from the mosquitoes, then fixed in 70% alcohol containing 5% glycerin and mounted in

the fixative. When it is not convenient to dissect mosquitoes, they can be preserved in 80% ethyl alcohol and later transferred through descending dilutions of alcohol to water, stained for three days in Mayer's acid haemalum, differentiated in distilled water for three days and placed in glycerin until dissected. The infective filaria larvae can be picked out when the mosquitoes are dissected and their external and internal characters are well defined. Sections can also be prepared by dehydrating the stained mosquitoes and clearing them in terpineol. The infective larvae of Dirofilaria spp., which are usually less than $1,000 \,\mu$, are easily distinguished from Wuchereria spp. and Setaria, which are more than $1,400 \mu$; the anus is nearer the tail in Dirofilaria than in Wuchereria and it has an intermediate position in Setaria; the "anal ratio" is approximately two in Dirofilaria and four in Wuchereria; the tail is cigarshaped in Dirofilaria whereas there is a definite narrowing of the tail in Wuchereria. The infective larvae of most species have caudal papillae, a single dorsal one and two lateral or ventral. The papillae are bubble-like and equal in size in W. bancrofti, they are little more than slight bulges in W. malayi and W. pahangi and the dorsal papilla is pronounced in W. patei. D. corynodes has three small papillae clustered at the caudal tip, D. repens has a small terminal papilla and two smaller subterminal papillae, D. immitis is like D. repens but the subterminal papillae are even smaller. S. equina has one large terminal papilla and two small subterminal papillae. Diagrams are given of the caudal ends of the species mentioned above and a key for the identification of infective larvae dissected from mosquitoes is provided.

832—RAZUMOVA, E. P. & GUTKOVSKAYA, A. I., 1959. [Tsentralnaya nauchno-issledovatelskaya laboratoriya gigieni i sanitarii na vodnom transporte.] [The fauna of copepods in a focus of Diphyllobothrium infection of the lake-river type.] Meditsinskaya Parazitologiya i Parazitarnie Bolezni.

Moscow, 28 (1), 89-94. [In Russian: English summary pp. 93-94.]
Razumova & Gutkovskaya studied the copepod fauna along the banks of the Svir and its navigable tributaries during two years. From May to October inclusive, 19 species of Cyclops and Diaptomus gracilis were found. The maximum development of cyclopids was observed in July and August, when 3 to 25 specimens were found per litre of water. They were less numerous in spring than in autumn. Of the copepods known to be the intermediate hosts of Diphyllobothrium latum, the most widely distributed species were Cyclops strenuus in the spring, Mesocyclops oithnoides and C. strenuus in the summer, and Acanthocyclops viridis and C. strenuus in the autumn. Only a few isolated eggs of D. latum were found during examination of over 100 samples of water from the same rivers. The eggs were most numerous in the spring and at the beginning of summer. There was ample possibility of pollution of the river with sewage. The authors conclude that navigable rivers offer fewer conditions for the infection of the first intermediate host with D. latum than lakes.

N. Jones

833—SYMES, C. B. & MATAIKA, J. U., 1959. [Filariasis Research Unit, Fiji.] "Observations on Microfilaria fijiensis Yeh, Symes and Mataika, 1958 from fruit bats (Pteropus hawaiiensis) in Fiji." Journal of Helminthology, 33 (2/3), 223–232.

Symes & Mataika describe experiments to discover the vector of Microfilaria fijiensis. Specimens of an ectoparasite of the bat, Cyclopodia molita, were examined but no developing larvae were found. Several species of mosquitoes were then experimentally fed on infected bats and development occurred in Aëdes pseudoscutellaris, A. fijiensis, A. polynesiensis and A. aegypti. The proportion of mosquitoes that became infective was small, development was erratic and sometimes delayed and it was concluded that none of the mosquitoes tested are good vectors. The filaria larvae develop in the thorax of the mosquitoes and the morphological changes are similar to those of Wuchereria bancrofti developing in mosquitoes. In A. pseudoscutellaris, third-stage larvae were found 7 to 14 days after the initial blood-meal; infective larvae in the proboscis were 0.52–0.824 mm. long and had two pairs of papillae on the tail.

P. Williams

834—YÜ, Y., HSÜ, C. K. & CHANG, P. H., 1959. [Institute of Parasitic Diseases, Chinese Academy of Medical Sciences.] "Surveys on mosquito fauna and the natural infection of filaria larvae in mosquitoes in 16 selected localities in Shantung Province." Chinese Medical Journal. Peking, 78 (2), 179.

In Shantung Province 25 species of mosquitoes belonging to the genera Anopheles, Mansonia, Aëdes and Culex were found. Only Culex pipiens var. pallens was found to be infected with filarial larvae.

N. A. Hancock

Mollusca

See also Nos.: 442, 447, 458, 554, 633, 656, 774, 775, 776, 777, 779, 857, 862, 870, 895, 896, 910, 911, 926, 938, 946.

835—BARBOSA, F. S., 1959. [Caixa Postal 459, Recife, Brazil.] "The snail hosts of Schistosoma mansoni and transmission of schistosomiasis in Brazil." International Congress of Zoology (15th), London, July 16-23, 1958. Proceedings, pp. 691-693. [Discussion p. 693.]

Barbosa gives an account of the snail hosts of Schistosoma mansoni and the transmission of schistosomiasis in Brazil. The paper opens with a discussion of the taxonomic status of the genera of the intermediate hosts of S. mansoni. It is pointed out that they all belong to the same genus but until the problem is finally decided it is suggested that the South American species should be left in Australorbis and Tropicorbis and the African ones in Biomphalaria. Only three species of Brazilian snails have been clearly demonstrated to carry S. mansoni, namely, A. glabratus, the best known and most efficient, A. nigricans, a very poor host and only known to carry schistosomiasis in the State of Rio de Janeiro, and T. centimetralis, a poor host with a wide distribution. The repopulation of habitats during the rainy season is discussed and the diapause in development of sporocysts during the aestivation of the snail hosts is described. C. A. Wright

836—BARBOSA, F. S., BARBOSA, I. & MORAIS RÊGO, A., 1959. [Instituto Nacional de Endemias Rurais, Centro de Pesquisas Aggeu Magalhães, Recife, Brazil.] "Laboratory infection of the snail Planorbarius metidjensis (Forbes) from French Morocco with a Brazilian strain of Schistosoma mansoni." Annals of Tropical Medicine and Parasitology, 53 (3), 314–315.

Barbosa et al. report the successful experimental infection of Planorbarius metidjensis from

French Morocco with a Brazilian strain of Schistosoma mansoni. Of twelve specimens exposed to 20 miracidia each and subsequently maintained at a temperature between 25°C, and 27°C. only one survived until the 28th day after exposure when it shed cercariae. Three other snails which had been exposed to large numbers of miracidia and fixed between 48 and 72 hours later were sectioned and showed a strong tissue reaction to the larvae which had penetrated.

C. A. Wright

837—BASCH, P. F., 1959. [Museum of Zoology, University of Michigan, Ann Arbor.] "Two new molluscan intermediate hosts for *Paragonimus kellicotti*." Journal of Parasitology, 45 (3), 273. Basch records two new molluscan hosts for Paragonimus kellicotti under experimental conditions. 20 adult flukes were recovered from the lungs of an experimentally infected cat and were placed in physiological saline. Within half an hour many eggs were shed, which were then washed several times in filtered lake water and kept at room temperature with daily changes of water. On the 25th day many of the eggs hatched immediately after the water was changed. Laboratory-bred snails of the following species were exposed to the miracidia: Pomatiopsis cincinnatiensis, Oncomelania nosophora, O. formosana, O. quadrasi and P. lapidaria (the normal host). Cercariae were eventually shed by P. cincinnatiensis, P. lapidaria and O. nosophora. C. A. Wright

838—FRAGA DE AZEVEDO, J., COASTA FARO, M. M. DA & GONÇALVES PEQUITO, M. M., 1958. "Sur l'autofecondation interne de l'Australorbis glabratus olivaceus." Anais do Instituto de Medicina Tropical. Lisbon, 15 (4), 843–853. [English and Portuguese summaries pp. 852–853.] Fraga de Azevedo et al. attempted to produce unisexual specimens of Australorbis glabratus olivaceus by ligaturing the male copulatory organ. These specimens were intended for use in breeding experiments when it was hoped that they would serve as females. However it was found that they were able to continue to produce eggs. From these observations it is concluded that self fertilization in these snails is internal and does not necessitate the passage of spermatozoa C. A. Wright from the male copulatory organ to the vagina.

839—GAMBINO, J. J., 1959. [State University of New York Teachers College, New Paltz, N.Y.] "The seasonal incidence of infection of the snail Nassarius obsoletus (Say) with larval trematodes."

Journal of Parasitology, 45 (4), 440, 456. 6,717 specimens of Nassarius obsoletus were collected from Greenwich Bay, Rhode Island at monthly intervals from October 1951 to June 1952 in a region in the low tide zone, and from

March 1952 to June 1952 in a tide pool in the high tide zone. 1,445 specimens were infected with one or more of eight species of larval Digenea the largest snails having the highest rate of infection. Molluscs in the tide pool had a slightly higher infection than those in the low tide zone. Infection was low from October to early March but it rose rapidly to a peak of 43% in late March and fell off in April and May to almost nothing in June. The most abundant parasites were the cercariae of *Himasthla quissetensis* and *Zoogonus lasius*, which fluctuated in the same way as the total infection. The cercariae of *Austrobilharzia variglandis*, however, reached a peak in late autumn. Gambino suggests that these seasonal changes are caused by the migrations of the final hosts. Since parallel results were obtained from the low tide zone and the high tide pool the fluctuations could not have been the result of a migration of *Nassarius obsoletus*.

B. L. James

840—KENDALL, S. B. & PARFITT, J. W., 1959. [Ministry of Agriculture, Fisheries & Food, Central Veterinary Laboratory, Weybridge, Surrey, U.K.] "Studies on the susceptibility of some species of Lymnaea to infection with Fasciola gigantica and F. hepatica." Annals of Tropical Medicine

and Parasitology, 53 (2), 220–227.

Kendall & Parfitt report the results of experiments to test the susceptibility to cross-infection of different strains of Lymnaea and Fasciola. They show that F. gigantica from Pakistan is capable of infecting L. natalensis from both East and West Africa as well as L. auricularia from Pakistan while F. gigantica from South Africa, although easily infective to both East and West African snails, is less easily established in snails of Pakistani origin. The paper also reports that young snails of both the African forms and of the Pakistani L. auricularia are slightly susceptible to British F. hepatica but that the infection dies out in the adult snails.

C. A. Wright

841—LASSANCE, M., 1958. [Laboratoire d'Hygiène de Stanleyville.] "Apparition à Stanleyville de Biomphalaria a. pfeifferi, vecteur de Schistosoma mansoni." Annales de la Société Belge de Médecine Tropicale, 38 (5), 953–960. [English, German, Spanish & Flemish summaries pp. 959–960.]

Lassance reports the finding of *Biomphalaria pfeifferi* at Stanleyville in the Belgian Congo in April 1956. Since that time this species of snail has spread rapidly in the area and is actively replacing *Physopsis africana* in many habitats. This spread is attributed to the greater tolerance of *B. pfeifferi* to the type of pollution associated with the development of the city. The implications of the spread of a potential intermediate host for *Schistosoma mansoni* in an area where this parasite does not at present occur are discussed and the relative pathenogenicity of *S. mansoni* and the relatively harmless *S. intercalatum*, the endemic species of schistosome in the Stanleyville district, is considered.

C. A. Wright

842—LOBATO PARAENSE, W. & DESLANDES, N., 1959. [Instituto Oswaldo Cruz, Brazil.] "The renal ridge as a reliable character for separating Taphius glabratus from Taphius tenagophilus."

American Journal of Tropical Medicine and Hygiene, 8 (4), 456-472. Paraense & Deslandes describe in detail the structure of the renal ridge in the snail *Taphius glabratus* [the authors are using *Taphius* as the senior synonym of *Australorbis*]. They show that the ridge is represented in young specimens by a line of pigment and the ridge does not develop until a size of about 6 mm. diameter is attained. Neither a pigmented line nor a true renal ridge is found in the closely related species *T.tenagophilus* thus providing a valid taxonomic character for discrimination between the two species. The histological details of the structure of the renal region in both species is well illustrated with excellent photographs of sections.

C. A. Wright

843—MANDAHL-BARTH, G., 1957. [Danmarks Akvarium, Charlottenlund, Denmark.] "Intermediate hosts of Schistosoma. African Biomphalaria and Bulinus: I." Bulletin of the World Health Organization, 16 (6), 1103–1163. [French summary p. 1145.]

Mandahl-Barth begins his account of the intermediate hosts of *Schistosoma* with an introduction to the general problems of taxonomic discrimination and nomenclature in the African Planorbidae. This is followed by a description of the anatomy in the genus *Biomphalaria* together with an account of the shell characters which are of use to the taxonomist. In the systematic

part of the work Mandahl-Barth has adopted the species-group system and the genus Biomphalaria is divided into four such groups as follows: the pfeifferi group, B. pfeifferi pfeifferi (Krauss), B. p. bridouxiana (Bourguignat), B. p. rhodesiensis n. subsp., B. p. nairobiensis (Dautzenberg), B. p. rüppellii (Dunker), B. p. gaudi (Ranson), B. germaini (Ranson); the choanomphala group, B. choanomphala choanomphala (Martens), B. c. elegans Mandahl-Barth, B. smithi Preston, B. stanleyi (Smith); the alexandrina group, B. alexandrina alexandrina (Ehrenberg), B. a. wansoni n.subsp., B. angulosa n.sp., B. tchadiensis (Germain)?; the sudanica group, B. camerunensis camerunensis (Boettger), B. c. manzadica n.subsp., B. sudamica sudamica (Martens), B. s. tanganyicensis (Smith). All of these forms are well described and their shells are illustrated by photographs. P. Knight

844—MANDAHL-BARTH, G., 1957. [Danmarks Akvarium, Charlottenlund, Denmark.] "Intermediate hosts of Schistosoma. African Biomphalaria and Bulinus: II." Bulletin of the World Health Organization, 17 (1), 1-65. [French summary p. 38.]

This paper forms the second part of Mandahl-Barth's work on the intermediate hosts of Schistosoma in Africa and deals with the genus Bulinus. As in the part dealing with Biomphalaria there is a preliminary description of the general anatomy of Bulinus with special emphasis on the characters of taxonomic importance. The systematic account divides the genus into four species-groups and the subgeneric names formerly used are now discarded. the species and subspecies are fully described and their shells are illustrated by photographs. The species are grouped as follows: the africanus group (formerly subgenus Physopsis), B. africanus africanus (Krauss), B. a. ovoideus (Bourguignat), B. abyssinicus (Martens), B. nasutus (Martens), B. ugandae Mandahl-Barth, B. globosus (Morelet), B. jousseaumei (Dautzenberg); the tropicus group (formerly part of the nominate subgenus), B. tropicus tropicus (Krauss), B. t. angolensis (Morelet), B. t. zanzebaricus (Clessin), B. t. mutandaensis (Preston), B. t. alluaudi (Dautzenberg), B. liratus (Tristram), B. sericinus (Jickeli), B. guernei (Dautzenberg); the truncatus group (formerly part of the nominate subgenus), B. transversalis (Martens), B. truncatus truncatus (Audouin), B. t. trigonus (Martens), B. t. rohlfsi (Clessin), B. coulboisi (Bourguignat), B. nyassanus (Smith); the forskalii group (formerly the subgenus Pyrgophysa), B. camerunensis n.sp., B. reticulatus Mandahl-Barth, B. cernicus (Morelet), B. forskalii (Ehrenberg), B. scalaris (Dunker), B. senegalensis Müller.

845—OKPALA, I., 1957. "Histopathological studies on Schistosoma mansoni infection in snails (Australorbis glabratus)." West African Medical Journal, 6 (4), 153–163.

Okpala describes some of the histopathological lesions due to infection with Schistosoma mansoni in the snail Australorbis glabratus. He has shown that sporocysts can develop in other parts of the body than the digestive gland, in particular the muscles of the foot and the gonad. The sporocysts which develop in the digestive gland grow more rapidly and produce more cercariae than those in other parts of the body, probably due to the better food supply in that organ. Cases of infection with larval trematodes causing the death of young snails are recorded and it is suggested that larval flukes may have an adverse effect upon snail populations.

C. A. Wright

846—PATTEN, J. A., 1959. [Middle Tennessee State College, Murfreesboro, Tennessee, U.S.A.] "Trematode infections in terrestrial mollusks of Minnesota." Journal of Parasitology, 45 (4),

In the Lake Itasca region of Minnesota eight of 53 terrestrial molluscs belonging to 13 different species were found to carry unidentified trematode infections (rediae, metacercariae or mesocercariae). Nematodes and cysticercoids were also recovered. The essential data are I. M. Watson set forth in a table.

847—SARWAR, M. M., 1958. [Chadda Building, Khawja Dil Mohd Road, Lahore, West Pakistan.] "Ecology and distribution of *Limnaea auricularia rufescens*, a proven intermediary of *Fasciola gigantica*, in the Punjab region of Pakistan." Agriculture Pakistan, 9 (1), 39–51.

Sarwar outlines the geographical distribution of Fasciola gigantica in the Punjab on the basis of the ecology of the intermediary, Lymnaea auricularia rufescens. The main features found

characterizing the snail habitats were the presence of *Typha* reeds, clay soil and percolation of water. The snail was found confined in distribution largely to submontane and hilly tracts; the greater part of the Punjab, comprising alluvial and canal irrigated plain, appeared to be free. The only exceptions in the plains in this respect were irrigation dams where the snail thrived. Such situations as rice fields, maintained irrigation canals, village ponds and saline marshes were found to be uninhabited by the snail.

M. M. Sarwar

848—SMITH, R. J., 1959. [Department of Biology, University of Detroit.] "Ancylid snails: first intermediate host to certain trematodes with notes on ancylids as a new host for Megalodiscus and Haematoloechus." Transactions of the American Microscopical Society, 78 (2), 228-231.

Smith records the finding of six species of cercariae in 10,000 specimens of Ferrissia novangliae from two marsh ponds in the Ann Arbor region. Two species of brevifurcate pharyngeate strigeatoid and one species of brevifurcate apharyngeate spirorchiid cercariae each showed 6% infection rate, an echinostome cercaria 19%, and a xiphidiocercaria 3%; while the amphistome Megalodiscus temperatus showed an infection rate as high as 60% during the summer and autumn. The cercariae of this amphistome were slightly smaller than those emerging from the normal host Helisoma trivolvis. Ancylid snails from Virginia and south Florida were found to be infected with furcocercous cercariae and xiphidiocercariae and nine species of cercariae were found in Ferrissia parallela from Douglas Lake, Michigan. These were three xiphidiocercariae (2% each), a brevifurcate strigeatoid (1%), a brevifurcate apharyngeate spirorchiid (1%), two species of echinostome (2% each), a non-pigmented amphistome (less than 1%) and a heavily pigmented amphistome (over 20%). One of the xiphidiocercariae appeared to be identical with that of Haematoloechus found in Planorbula armigera in a nearby ditch and the non-pigmented amphistome appeared to be identical with M. temperatus from Ann Arbor. C. A. Wright

849—WINKLER, L. R. & WAGNER, E. D., 1959. [School of Tropical and Preventive Medicine, Department of Microbiology, College of Medical Evangelists, Loma Linda, California, U.S.A.] "Filter paper digestion by the crystalline style in Oncomelania." Transactions of the American Microscopical Society, 78 (3), 262–268.

Winkler & Wagner have shown that adult specimens of Oncomelania nosophora can survive for 245 days in de-ionized water with a diet of filter paper while a control group to which no paper was given were all dead by the 85th day. Chromatograms of squashed snails which had been fed on pure cellulose labelled with C¹⁴ indicated that the cellulose was actually being broken down by the snails. Following earlier suggestions that cellulases are present in the crystalline style of those gastropods which possess this organ the authors devised an experimental technique to demonstrate the fact. Freshly dissected-out styles were washed and then incubated on the start line of a piece of chromatography paper which was subsequently dried and run in a solvent system for the separation of sugars. A spot on these chromatograms corresponding to glucose indicated that digestion of the paper had occurred. C. A. Wright

850—ZARIF, M., 1958. "Effect of the developmental stages of the latest fluke, *Dicrocoelium dendriticum* (Rudolphi 1819) Looss 1899, on the land snail *Cionella lubrica*." Pakistan Journal of Scientific Research, 10 (2), 65–66.

Zarif tested the lethal effects on the land snail, Cionella lubrica, of increasingly larger infections with Dicrocoelium dendriticum larvae. The snails used in the test had been collected from an area near Ithaca, New York, and they were believed to be free from Dicrocoelium infection at the time of their collection. A series of five batches of the snails (comprising 25 snails each) were exposed, respectively, to infection with Dicrocoelium eggs at the rate of 20, 40, 80, 160 and 320 per snail. After 90 days of infection, the percentages of survivals in the corresponding batches of snails were 80, 84, 72, 52 and 28. The percentage of survivals in the control, however, was 84. [No mention is, however, made of the degree of sporocyst infection in the infected snails.]

Control

See also Nos.: 458, 505, 506, 515, 554, 823.

851—CHERNIN, E., 1959. [Department of Tropical Public Health, Harvard School of Public Health, Boston 15, Mass.] "Notes on the effects of various antibiotics on Australorbis glabratus." Journal of Parasitology, 45 (3), 268.

Chernin reports the results of a series of experiments designed to investigate the effects of antibiotics on the snail Australorbis glabratus. The effects of streptomycin are reduced or obviated by the addition of commercial potting soil to the water and the reaction to streptomycin can be reversed by the addition of calcium chloride to the water within 24 hours of exposure to the antibiotic, but manganese chloride is not effective in the same way. The chelating agent disodium EDTA did not provoke a streptomycin-like reaction. The following antibiotics were tested for activity against snails: patulin, tyrothrycin, bacitracin zinc, subtilin, polymixin B sulphate, tetracycline HCl, oxytetracycline HCl, chlortetracycline, erythromycin, neomycin sulphate, chloramphenicol, actidione, actinomycin D, viomycin sulphate, spiramycin sulphate, cycloserine Ca salt, novobiocin monosodium, streptogramin, pleocidin and experimental antibiotics L-565,329-0-I and L-545,281-0-4. Nystatin was also included in the test series and, together with pleocidin, patulin and L-565,329-0-I, was one of the few to show any marked activity.

C. A. Wright

852—CROSSKEY, R. W., 1958. [Simulium Control Unit, Ministry of Health, Northern Nigeria.] "First results in the control of *Simulium damnosum* Theobald (Diptera, Simulidae) in Northern Nigeria." Bulletin of Entomological Research, 49 (4), 715–735.

Crosskey applied D.D.T. in the control of Simulium damnosum in the region of Abuja (Niger Province) over an area of 1,200 sq. miles. The treatment was carried out during the dry and early rain seasons of 1956 and 1957. Four treatment posts were established in 1956 and seven in 1957 on four rivers. A constant quantity (28 lb.) of technical grade D.D.T. with 70% p,p' isomer mixed with diesel oil was poured into the rivers for 30 minutes at each treatment in 1956. Thus the average dose of p,p' isomer was 1.4 p.p.m. In 1957 the application of technical grade D.D.T. was 0.16 lb. per cusec (cu. ft. per sec.), giving a uniform concentration of 1 p.p.m. in p,p' D.D.T. isomer. The insecticide was also mixed in diesel oil (22 gallons per application) and applied as in the previous treatments. Each treatment point received 12 applications at intervals of one week. As a result of the treatment in 1956, larvae and pupae of S. damnosum were destroyed on a nine mile stretch after the sixth treatment, and on 13-mile and 15 to 23-mile stretches downstream after the ninth and twelfth applications respectively. Immature S. damnosum were destroyed on 8-mile to 22-mile stretches downstream as a result of treatment in 1957. Larvae and pupae were found again, although in smaller quantities, after the rains in previously cleared river stretches. Density of adult S. damnosum as counted in F.B.H. units (flies settling on a boy in one hour), was 8.88 in 1955 (before treatment). It was reduced to 0.32 F.B.H., i.e. by 96.4%, as a result of treatment in 1956. After the treatment of 1957 the fly density was 1.49 F.B.H., i.e. reduced by 83·22% as compared with the pre-treatment year. Immature stages of S. bovis, S. cervicornutum, S. adersi and S. medusaeforme were affected in the same way as those of S. damnosum. S. bovis appeared to take a longer time to re-establish itself after treatment than the other species. No effect from D.D.T. was observed on other insect life or on crustaceans and tadpoles. However, some mortality was observed among fish fry. N. Iones

853—D'AUBENTON, F. & BLANC, M., 1959. [Attaché de Recherches au C.N.R.S.] "Nouveaux essais d'insecticides concernant la lutte contre l'onchocercose." Médecine Tropicale, 19 (2), 217–221.

D'Aubenton & Blanc tested the toxicity to fish of a number of products containing D.D.T. the use of which in the control of *Simulium* larvae in French Equatorial Africa is envisaged. A product containing 300 gm. of D.D.T. per litre, lacking paraffin, and having a density of 0.968 at 20°C. was found to be most satisfactory under the conditions of the experiments. Dosage in excess of 0.5 mg. per litre was lethal to certain types of fish. Addition of methylene blue or fluorescein to the product was ineffective as a means of colorimetric estimation of concentration. Field trials are recommended.

854—ISODA, M., NAGANO, K., KIMINAMI, S. & AOYAGI, K., 1958. [Studies on extermination of Lymnaea snail, intermediate host of Fasciola hepatica, by raising carp in the paddy field.] Journal of the Japanese Veterinary Medical Association, 11 (2), 72–74. [In Japanese.]

Carp were put into water where Lymnaea snails were abundant. That the carp fed on the snails was confirmed. Although complete extermination throughout the whole irrigation system could not be expected by this method, the raising of carp in the paddy-fields is recommended wherever it is possible.

855—KLOCK, J. W., GERHARDT, C. E., ILDEFONSO, V. & MATEO SERRANO, J., 1957. [Communicable Disease Center, U.S. Public Health Service, Department of Health, Education and Welfare, Atlanta, Ga, U.S.A.] "Characteristics of sodium pentachlorophenate used against Australorbis glabratus in Puerto Rico." Bulletin of the World Health Organization, 16 (6), 1189–1201. [French summary p. 1201.]

Klock et al. report the results of investigations into the use of sodium pentachlorophenate as a molluscicide in Puerto Rico. Preliminary laboratory tests indicated that two ranges of concentration, namely, 3-15 p.p.m. and 100-200 p.p.m., were economically preferable for field application. Field trials showed that concentrations of 15 p.p.m. for 125 p.p.m.-hours proved most satisfactory, and that 100% kill of eggs was obtained by doubling the exposure time needed to kill the adult snails. Experiments using the molluscicide compacted into solid masses suggested that this method of treatment is only suitable for slow moving or impounded waters. Supplementary marginal spraying of the habitats is recommended. Laboratory studies revealed that a lethal dose of molluscicide could penetrate the shell of the snails without actually coming into direct contact with the soft parts of the animal's body.

GENERAL HELMINTHOLOGY

Technique

See also Nos.: 482, 502, 509, 526, 544, 604, 609, 611, 626, 725, 753, 754, 755, 762, 831.

856-ADAMSON, D. H., 1959. "A method for concentrating hydatid hooklets." Journal of the New Zealand Association of Bacteriologists, 14 (2), 44-45.

Hydatid hooklets are destroyed by strong sulphuric or nitric acids, but can resist immersion in strong hydrochloric acid for at least three days or boiling acid for several minutes. Hooklets can be demonstrated in calcified cyst contents after overnight treatment with acid or after five minutes boiling in acid with or without removal of lipids by washing with ether. Sputum may be mixed with two volumes of acid and boiled for five minutes. Extracts are centrifuged at 2,000 r.p.m. for five minutes and hooklets sought in the deposit. L. K. Whitten

857—BARBOSA, F. S., BARBOSA, I. & CARNEIRO, E., 1958. [Caixa Postal 459, Recife, Brazil.] "Técnica de inseminação artificial nos planorbídeos." Anais do Instituto de Medicina Tropical.

Lisbon, 15 (2), 397-400. [English & French summaries pp. 399-400.] Barbosa et al. describe a technique for the artificial insemination of planorbid snails. After five hours narcosis with menthol the foot of the snail is gently pulled out until the mantle border covering the female genital pore is exposed. It is usually necessary to cut back part of the body-whorl of the shell in order to facilitate the manipulation. The spermatozoa are obtained from the seminal vesicles of a donor snail, suspended in 0.7% saline, and introduced into the vagina of the narcotized individual by means of a fine Pasteur pipette. For work with Australorbis glabratus the maximum external diameter of the tip of the Pasteur pipette is 0.18 mm. C. A. Wright

858—BIAGI F., F. & GONZÁLEZ, C., 1959. [Unidad de Patología, Escuela de Medicina, U.N.A.M. Hospital General, México 7, D.F.] "Estudio de métodos para el recuento de huevos en materia fecal." Revista Latinoamericana de Microbiología. Mexico, 2 (1), 51-62. [English sumarry p. 61.] Biagi & González made 1,536 egg counts on a total of 384 faecal samples from 122 persons infected with helminths. One group of samples was examined simultaneously by the Beaver, Stoll, Ferreira 1:10 and Ferreira/Solids methods. The other group was simultaneously

examined also by these methods, except that Beaver's method was replaced by that of Mazzotti. The degree of uniformity of the counts was expressed by the differential index

$$= I.D. = \frac{\text{difference between 2 counts}}{\text{high count}} \times 100,$$
 or I.D. =
$$\frac{\text{difference between Stoll's and another method}}{\text{count by Stoll's method}} \times 100.$$

It was also expressed by the index of variation method

= I.V. =
$$\frac{\text{high count}}{\text{low count}}$$
 or I.V. = $\frac{\text{other method}}{\text{Stoll's method}}$

The differential index was found to be low, medium or high. The helminths in question were *Hymenolepis*, *Ancylostoma*, *Ascaris*, *Trichuris* and *Strongyloides*. The I.V. values were the following for different methods: Beaver, 2·4; Mazzotti, 2·3; Stoll, 2·8; Ferreira 1:10, 2·6; Ferreira/Solids, 3·7. It was concluded that (i) the results of a single egg count cannot represent the number of helminths in the host and that the results of three successive tests would be nearer to the reality; (ii) the results of successive counts cannot be corrected by any of the methods described; (iii) consistency of faecal samples does not appear to be a decisive factor as regards the uniformity of egg counts. The methods of Beaver, Mazzotti and Stoll failed to show eggs in 39% to 48% of the samples examined and the Ferreira/Solids method gave the most divergent counts; therefore the authors recommend the employment of the Ferreira 1:10 method, which had only 0·2% as the incidence of failure.

N. Jones

859—BOGOMOLOVA, T. T. & NAUMOVA, R. P., 1959. [Kafedri biokhimi i infektsionnikh bolezni Odesskogo meditsinskogo instituta imeni N.I. Pirogova.] [Diagnostic value of skin tests with a new allergen in echinococcosis.] Meditsinskaya Parazitologiya i Parazitarnie Bolezni. Moscow, 28 (2), 224–226. [In Russian: English summary p. 226.]
Bogomolova & Naumova used allergen prepared by the method of Tsuverkalov with echino-

coccal cysts from the liver of cattle in skin tests for hydatid disease. Ground cysts were put into normal sulphuric acid, autoclaved for one hour and filtered. The filtrate was neutralized to a final pH of 8 to 9 and coagulated protein removed after each neutralization. If protein was still found in the filtrate, the latter was dialysed in a refrigerator until the sulphate ion and acid reaction disappeared. The dialysate was evaporated to one-half to one-third of its original volume and sodium chloride was added until the concentration in it reached that of physiological salt solution. The material so obtained was heated at 80°C. for five minutes on a water bath and sterilized in boiling water. This hydrolysate was compared with Casoni's reaction in 44 cases of suspected hydatid, In the summaries it is stated that of 24 subjects infected with hydatid the intradermal test with the new antigen was positive in 21 whereas the Casoni test was positive in only 13. [It is not clear how these figures are derived from the corresponding table in the text.] In a control group of 258 persons, suffering from different diseases, tests were made with hydrolysate and with Casoni's reaction. The latter gave four positive results and the hydrolysate gave one positive reaction. Three of the four Casoni positive reactions were non-specific. The authors claim that the new allergen provides a more specific test than Casoni's reaction. [The percentage of positive specific reactions is not clear from the published results.] N. Iones

860—BRYGOO, E. R. & RANDRIAMALALA, J. C., 1959. [Institut Pasteur de Madagascar.] Différence de colorabilité au Ziehl entre les oeufs de Schistosoma mansoni et ceux de Schistosoma haematobium." Bulletin de la Société de Pathologie Exotique, 52 (1), 26-27.

Brygoo & Randriamalala have confirmed that Ziehl's carbol fuchsin stains the shells of *Schistosoma mansoni* eggs in histological sections. The sections, after fixation in Bouin's fluid, are treated with lithium carbonate [alcoholic solution?] to remove the picric acid. They are reacidified in N/10 hydrochloric acid for one minute before staining in cold Ziehl's carbol fuchsin for 30 minutes. This technique does not stain the eggs of *S. haematobium* and this observation has been used for differentiation, in sections, of the eggs of the two species. The

authors point out the possible difference in chemical composition of these egg shells and suggest that eggs of other helminth species should be examined for their ability to become stained by this technique.

J. E. D. Keeling

861—CH'EN, T. T., 1959. [Nanking Army Hospital.] "Alcoholic solution of eosin and hydrochloric acid for increasing staining properties." [Abstract.] Chinese Medical Journal. Peking, 78 (2), 172.

For staining microfilariae in thick blood films, Ch'en recommends the use of a 10-second treatment with a 0.25% solution of eosin in 95% alcohol to which 4 ml. of normal hydrochloric acid has been added, followed by an 8 to 12 second immersion in P'inlan rapid stain (prepared from methyl blue R).

J. M. Watson

862—CHERNIN, E. & SCHORK, A. R., 1959. [Department of Tropical Public Health, Harvard School of Public Health, Boston 15, Mass., U.S.A.] "Growth in axenic culture of the snail, Australorbis glabratus." American Journal of Hygiene, 69 (2), 146–160.

Chernin & Schork describe the results of attempts to maintain Australorbis glabratus in axenic culture. Snails were hatched under sterile conditions and then placed in tubes in "handling solution"; a variety of foods were tried and the one which proved most effective was a mixture of autoclaved (10 lb. for 10 minutes) brewer's yeast and formalin-killed Escherichia coli, killed in 7% formol saline and subsequently washed in two changes of "handling solution". After reaching a size of about 2 mm. diameter the snails did not grow well unless they were transferred to larger containers, and it was found that even better growth was obtained by transferring the snails to sterilized aquarium water instead of "handling solution". Of two different strains of snails used it was found that they had different mean hatching sizes and also differed in their ability to grow in sterile culture media.

863—CHURCH, B. M., GOUGH, H. C. & SOUTHEY, J. F., 1959. "Soil sampling procedures for potato root eelworm cysts." Plant Pathology. London, 8 (4), 146–151.

Church et al. analysed data obtained from systematic sampling of 12 fields with Heterodera rostochiensis infestations ranging from 4 to 40 full cysts per 50 gm. soil. Distribution was rather uneven and the authors make certain recommendations for routine sampling. The bulk sample taken per field or unit up to ten acres should be at least 1,000 gm. (preferably 2,500 gm.) comprising at least 25 (preferably 50) cores located systematically on a grid. At least 100 gm. (preferably 200 gm.) soil from each bulk sample should be examined, with a repeat examination at critical infestation levels. For experimental work the number of borings, bulk sample and laboratory sample should all be increased, with two or more bulk samples per field.

R. D. Winslow

864—CORTINI, M. & FERRETTI, G., 1959. [Istituto di Parassitologia dell'Università di Roma.] "L'inclusione in agar-celloidina-paraffina per l'allestimento di preparati istologici di trematodi e di cestodi." Parassitologia. Rome, 1 (1), 76-77.

Cortini & Ferretti enumerate the advantages of triple embedding in agar-celloidin-paraffin wax for the histological examination of small trematodes and cestodes and for making serial sections. The technique is as follows: (i) inclusion and orientation of the object in 1-2% agar, molten at 50°C.; (ii) washing of the agar block, after solidification, in methyl benzoate for 10 to 30 minutes; (iii) immersion for 24 hours or more in a 1-2% solution of celloidin in methyl benzoate; (iv) second washing in methyl benzoate; (v) immersion in xylol for two to six hours; (vi) passage into xylol-paraffin first for one hour at 37°C. and then at a temperature gradually rising to that of the paraffin bath; (vii) embedding in paraffin. W. K. Dunscombe

865—DURIE, P. H., 1959. [Division of Animal Health and Production, C.S.I.R.O., Veterinary Parasitology Laboratory, Yeerongpilly, Queensland, Australia.] "A new technique for the recovery of infective strongyle larvae from soil and pasture." Journal of Helminthology, 33 (2/3), 189–196. Durie describes an apparatus for separating infective strongyle larvae from soil and grass. The technique depends upon differences in size and density of larvae and particles of debris. Separation is achieved by directing a stream of water upwards in a conical funnel so that there is a gradual decrease in the rate of flow towards the top of the funnel. The larvae are washed

over the top of the funnel and collected in a sieve with 23μ apertures. Debris is retained in the funnel. The number of larvae on the sieve is estimated by a dilution sampling method for which a simple counting chamber is described. Durie recommends killing the larvae before attempting separation and describes the use of the apparatus with soil and pasture samples. The efficiency of the technique was assessed by introducing known numbers of larvae into soil and pasture washings and recording the numbers recovered. The mean recovery rate over a series of tests was estimated to be 76% + 10%.

866—GOFFART, H., 1959. [Biologische Bundesanstalt, Institut für Hackfruchtkrankheiten und Nematodenforschung, Münster/Westf.] "Methoden zur Bodenuntersuchung auf nichtzystenbildende Nematoden." Nachrichtenblatt des Deutschen Pflanzenschutzdienstes. Stuttgart, 11 (4), 49-54. [English summary p. 54.]

Taken in conjunction with Goffart's earlier paper on techniques for dealing with cyst-forming nematodes [for abstract see Helm. Abs. 29, No. 235], this comprehensive account of methods of extracting non-cystic nematodes from soil and plant material completes the German equivalent of the sections on extracting and counting found in Goodey's Bulletin [for abstract see Helm. Abs., 26, No. 41a] and in the Dutch handbook by s'Jacob & Stemerding [for abstract see Helm. Abs., 25, No. 5861.

867—HASBROUCK, E., 1959. "Gold chloride and picric-acid-iodine as in toto stains for free-living and plant-parasitic nematodes." [Abstract of paper presented at the 16th Annual Meeting of the Potomac Division, American Phytopathological Society, Beltsville, Md, February 26-27, 1959.] Phytopathology, 49 (8), 523-524.

Plant-parasitic and free-living nematodes were differentially stained in toto by two different methods. The first, employing 0.1% gold chloride and 0.1% mercuric chloride, differentially stained nerve tissue and gonads a bright red and also deposited a fine black precipitate externally which accentuated cuticular details. Temporary mounts were stained with 0.001% iodine and 0.5% picric acid in formol acetic acid. Sclerotized and glandular structures were thus clearly differentiated. C. C. Doncaster

868—JEZIORAŃSKA, A. & BARCISZEWSKI, M., 1959. [Zakład Chorób Zakaźnych, Studium Doskonalenia Lekarzy, Bydgoszcz, Poland.] "Odczyny immunologiczne w przebiegu epidemii włośnicy w Bydgoszczy w r. 1957." Medycyna Doświadczalna i Mikrobiologia, 11 (1), 53-61. [English & Russian summaries pp. 59-60.]

Serological tests were applied for the confirmation of clinical findings in 284 hospital patients during an outbreak of trichinelliasis in 1957 in Bydgoszcz. Tests with urine and rabbit sera were positive in 24% of 117 cases. The tests were started on the 18th day of illness. A study of the time of their application showed that the highest number of positive results is obtained between the 11th and 15th day, therefore, this method of diagnosis is particularly useful during the early phases of the disease. With the ring precipitation reaction 69% of 144 tests were positive. This reaction is suitable for mass application and is particularly useful between the 31st and 35th day of infection, but occasionally gives positive results with healthy persons. 67% of 65 precipitations with live larvae were positive, the number growing with advance in infection. This reaction is most specific but is unsuitable for mass application. Of 149 complement fixation tests, 58% of those made after the 10th day of illness were positive. This reaction is a useful confirmation of infection during its later stages. G. I. Pozniak

869-MALDONADO SAMPEDRO, M., 1958. [Sección de Paludismo de Cádiz.] "Estudio comparativo de los procedimientos de concentración y recuento de huevos en técnica coprológica, con inclusión de un método personal. Su valor epidemiológico." Revista de Sanidad e Higiene Pública. Madrid, 32 (9/10), 426-461.

Maldonado Sampedro discusses extensively the degree of accuracy and sources of errors of some classical egg counting techniques. He describes his own technique, which he calls double concentration technique, combining flotation and centrifugation. The techniqe is as follows: (i) 5-10 gm. of faeces are triturated with an equal quantity of saturated salt solution; (ii) saturated salt solution is added up to the brim and the glass is covered with a

7.5 cm. by 9.5 cm. slide so that it makes contact with the contents and is left there for 15–20 minutes; (iii) the matter adhering to the slide is washed down with water into a centrifuge tube and more water added to the total volume of 5–6 c.c., then 4–5 c.c. of ether is added; (iv) the whole is centrifuged for two to three minutes at 1,800 revolutions per minute; (v) the supernatant liquid is decanted and the sediment examined under the microscope. For quantitative diagnosis a second slide is used. It is claimed that by this method only 5% of the eggs are lost, which fact is taken into account at the final estimation. Some other advantages claimed for this technique are the simple apparatus, the combination of flotation and centrifugation, and the greater quantity of faeces used.

870—MICHELSON, E. H., 1959. [Department of Tropical Public Health, School of Public Health, Harvard University, Boston, Massachusetts, U.S.A.] "A technique for securing and maintaining bacteriologically sterile prosobranch snails." Transactions of the American Microscopical Society, 78 (3), 256–261.

Michelson describes a technique for obtaining bacteriologically sterile prosobranch snails (Viviparus japonicus). Female snails were selected and their shells carefully cleaned with a stiff brush, then allowed to dry and the surface disinfected by painting three times with a 1:1,000 tincture of Metaphen. The shell was then opened with sterile instruments and the young snails were removed from the uterus and placed in petri dishes containing antibiotics in a suitable salt solution. They were then transferred to culture tubes in 5 ml. of culture medium (the most satisfactory proved to be Chernin's handling solution) and maintained at 20°C. No food was provided and individual snails were observed to live as long as 225 days. A high level of sterility was achieved; only eleven cultures out of a total of 175 were found to be contaminated.

C. A. Wright

871—MUELLER, J. F., 1959. [State University of New York, Upstate Medical Center, Syracuse 10, New York.] "The laboratory propagation of Spirometra mansonoides as an experimental tool. I. Collecting, incubating and hatching of the eggs." Journal of Parasitology, 45 (4), 353–361. Mueller describes the methods used in obtaining large numbers of coracidia from the faeces of cats infected with Spirometra mansonoides. The cats are housed in individual cages with mesh floors and, at the time of faeces collection, fed on a diet of lean horse meat. Faeces are emulsified with water and passed through a series of sieves, then sedimented and decanted several times. At the end of this process the ova are "almost 100 per cent clean". They can be stored almost indefinitely at 4°C. after the addition of a little alcoholic iodine to prevent contamination. The ova are incubated at room temperature (25–27°C.) for about 10 days, undergoing constant forced aeration and agitation. The eggs containing active oncospheres can be stored at 4°C. A change of physical conditions such as exposure to direct sunlight, change of water, agitation, rise or fall of temperature will stimulate a rapid hatch of coracidia. A method of examining the coracidia is described in detail. This utilizes a dark field technique with a binocular dissecting microscope. It is suggested that the coracidia have a specific gravity close to 1.0 as they cannot be concentrated by high speed centrifuging.

J. E. D. Keeling

872—NARAYANDAS, M. G., 1958. [Malaria Institute of India, Delhi, India.] "New fixatives for staining microfilariae." Indian Journal of Malariology, 12 (3), 209-215. Narayandas used a mixture of three parts of absolute alcohol with one part of normal hydrochloric acid (Fixative I) for fixing various microfilariae in the blood of man, dog, partridge and garden lizard (Calotes). The fixative was applied to fresh blood smears after dehaemoglobinization for three minutes with 20% alcohol. The fixing process lasted in different batches for 10 and 30 minutes, after which the slides were passed through 90% and 70% alcohols to water and stained with Delafield's hematoxylin, J.S.B. I and II, Giemsa, Ehrlich's hematoxylin or Schiff's reagent followed by Feulgen's technique. The results obtained with the new fixative were better than those obtained with either of its components or with methyl alcohol. The author also redescribes Fixative II. [For abstract see Helm. Abs., 27, No. 236b.]

873—PROST, E., 1959. [Zakład Higieny Produktów Zwierzęcych, Wyższa Szkoła Rolnicza, Lublin, Poland.] "Skuteczność badań trychinoskopowych w rzeźniach." Wiadomości Parazytologizne, 5 (2/3), 293–297. [English summary p. 297.]

Prost questions whether trichinelloscopy, used for many years in abattoirs in Poland, fulfils its task. Of 86 samples of slightly infected pork, 100% were shown to be infected by the digestion method but only 75% by trichinelloscopy. Furthermore, trichinelloscopy found only 52% of the larvae disclosed by the digestion method. Of 1,000 pigs classed as free from infection at an abattoir, three were incriminated by the digestion method. Despite these imperfections, trichinelloscopy is at present the only practicable method in Poland and has, in past years, contributed to a reduction of infected pigs.

G. I. Pozniak

874—SANWAL, K. C., 1959. [Nematology Section, Entomology Research Institute, Canada Department of Agriculture, Ottawa.] "A simple method for rearing pure populations of the foliar nematode, Aphelenchoides ritzemabosi, in the laboratory." Canadian Journal of Zoology, 37 (5), 707–711. Mature female worms of Aphelenchoides ritzema-bosi are placed in a drop of water on the ventral surface of a chrysanthemum leaf which is then placed with its petiole in moist sand. Single leaves, or batches of leaves, in sand are kept in moist chambers the construction of which is described. Symptoms of infection may be seen within 7–11 days. This method permits the rearing of a pure eelworm population derived from a single adult female worm. J. J. Hesling

875—SHEPHERD, A. M., 1959. [Nematology Department, Rothamsted Experimental Station, Harpenden, Herts.] "Increasing the rate of larval emergence from cysts in hatching tests with beet eelworm, *Heterodera schachtii* Schmidt." Nematologica, 4 (3), 161–164. [German summary p. 164.]

Compared with the standard technique of hatching cysts in watch glasses, a considerable increase in the rate of emergence of larvae from cysts of *Heterodera schachtii* can be obtained by using small sieves made of polythene tubing and nylon material, which allow the cysts to be aerated all round. An increase of up to four times the rate can be achieved after two weeks. The rate of hatch in water is also slightly increased when sieves are used. However, the total hatch is not significantly different in the two methods. The addition of fungistatic and bacteriostatic substances to the hatching medium provides a further increase, both in rate of emergence and in total hatch. This may be due either to a suppression of the micro-organisms competing for oxygen or to a direct hatching stimulus.

A. M. Shepherd

876—TROMBA, F. G., 1959. [Animal Disease & Parasite Research Division, Agricultural Research Service, U.S. Department of Agriculture, Beltsville, Maryland, U.S.A.] "A technique for oral infection of earthworms." Proceedings of the Helminthological Society of Washington, 26 (1), 65–66.

Tromba describes a method which he has successfully employed for the infection of earthworms with larvae of *Stephanurus dentatus* and eggs of *Metastrongylus apri* and *Choerostrongylus pudendotectus*. The infective material (0·05 to 0·1 ml.) is injected *per os*, using a tuberculin syringe fitted with a 20-gauge needle which has been blunted and smoothed at the tip, into the oesophagus of the earthworm after the latter has been washed with tap-water briefly (30 to 60 seconds), immersed in 20% ethyl alcohol, and again washed in tap-water. 87% of earthworms so infected survived.

J. M. Watson

Geographical Distribution

See also Nos.: 472, 475, 483, 488, 499, 500, 501, 503, 515, 517, 519, 528, 533, 535, 538, 540, 546, 549, 550, 564, 584, 612, 629, 631, 633, 655, 659, 664, 673, 681, 693, 695, 698, 704, 719, 722, 728, 737, 740, 743, 847; Medical Helminthology Surveys; Taxonomy—all sections.

877—CAGNOLATI, G. C. & MERIGHI, B., 1959. [Istituto di Parassitologia dell'Università di Roma.] "Reperto di larve di *Trichinella spiralis* (Owen, 1835) in una volpe catturata nella Provincia di Roma." Parassitologia. Rome, 1 (1), 78–79.

A fox caught in the province of Rome was found to be infected with *Trichinella spiralis*. Up till now indigenous trichinelliasis has not been suspected in this area. W. K. Dunscombe

878—CHU, G. W. T. C., 1958. "Pacific area distribution of fresh-water and marine cercarial dermatitis." Pacific Science 12 (4), 299-312.

Chu summarizes the distribution of schistosome dermatitis and avian schistosomiasis throughout the whole Pacific area. Occurrence of the disease is noted in both marine and fresh-water environments. The author also notes the occasional occurrence of marine dermatitis which is P. Knight due to organisms other than schistosome cercariae.

879—GIBBS, H. C. & FULLER, W. A., 1959. [Division of Animal Pathology, Branch Laboratory, Macdonald College, Quebec, Canada.] "Record of Wyominia tetoni Scott, 1941 from Ovis dalli in the Yukon Territory." Canadian Journal of Zoology, 37 (5), 815.

Gibbs & Fuller collected about 30 Wyominia tetoni from four male Ovis dalli one-and-a-half to seven-and-a-half years old, from Sheep Mountain at the mouth of Slim's River (milepost 1061-Alaska Highway). This is a new host and locality record for this species. There was little evidence that the worms were pathogenic.

880—GRUNDMANN, A. W., 1959. [Department of Zoology, University of Utah.] "Parasites recovered from six species of Utah lizards." Journal of Parasitology, 45 (4), 394.

Grundmann reports on the examination of 47 intestinal tracts of six species of lizards from desert valleys and low mountains of the Great Salt Lake Desert of Western Utah. Two linstowid cestode species were recovered: Oochoristica phrynosomatis from Phrynosoma platyrhinos and O. bivitellobata from Cnemidophorus tigris. Seven nematode species were recovered: Pharyngodon werneri and Angusticaecum sp. from C. t. tigris; Monhysterides sp. from Phrynosoma platyrhinos, Crotaphytus collaris baileyi and C. wislizenii; Skrjabinoptera phrynosoma and Pharyngodon sp. from Phrynosoma platyrhinos; Physaloptera obtusissima from C. collaris baileyi; and Physaloptera retusa from Sceloporus occidentalis longipes. E. I. Sillman

881—KOLENDO, A., 1959. [Katedra Parazytologii, Wyższa Szkoła Rolnicza, Lublin, ul. Akademicka, Poland.] "Helmintofauna ropuchy zielonej—Bufo viridis Laur. województwa lubelskiego." Acta Parasitologia Polonica, 7 (13/22), 431–439. [English summary p. 439.]

100 Bufo viridis were examined in the Lublin area and all found infected with helminths. The species present were Pleurogenes claviger, Pleurogenoides medians, Opisthioglyphe ranae, Alaria alata metacercariae (recorded for the first time from Bufonidae), Gorgodera sp. (trematodes), Rhabdias bufonis, Oswaldocruzia goezei, Cosmocerca ornata, Oxysomatium schneideri (nematodes) and Acanthocephalus ranae. The change of the fauna with the age of the host is described.

882—MENDHEIM, H., 1959. [Institut für Zoologie, Nutztier- und Schädlingskunde der Technischen Hochschule, München.] "Helminthen aus Säugetieren. I. Über die Verbreitung der Gattung Catenotaenia Janicki, 1904." Zentralblatt für Bakteriologie, Parasitenkunde, Infektionskrankheiten und Hygiene. Abteilung 1. Originale, 174 (3/4), 291-292.

Mendheim reviews the literature on the distribution of the genus Catenotaenia. He also refers to his own findings in 1943-44 in Silesia. N. Iones

883-MERKUSHEVA, I. V., 1958. [Evidence that rodents are natural carriers of trichinelliasis and echinococcosis in Byelorussian S.S.R.] Dokladi Akademii Nauk BSSR. Minsk, 2 (3), 134-135. [In Russian.]

Merkusheva has examined for Trichinella spiralis infection, 968 rodents (17 species) and 37 insectivores (three species) caught in different habitats in southern White Russia. T. spiralis was present in two Rattus rattus, one Mus musculus and one Microtus arvalis. None of the 595 animals caught in forest areas was infected. She found also Echinococcus multilocularis in one Apodemus agrarius and claims that this is the first record of this parasite for White Russia.

G. I. Pozniak

884—PANEBIANCO, F., 1957. [Cattedra di Parassitologia della Università di Pisa.] "Crenosomiasi nell'Erinaceus europaeus. Studio istopatologico." Atti della Società Italiana delle Scienze Veterinarie, 11, 731-733. [English & French summaries p. 733.]

Panebianco frequently recovered Crenosoma striatum from Erinaceus europaeus captured in Sicily and Calabria. The site of the parasites was the bronchi and bronchioles, which were often occluded as a consequence of the infection. Histopathological changes consisted of hyperplasia and hypertrophy of the muscular wall structures of the bronchi and bronchioles and the parenchyma showed chronic alveolar emphysema.

N. Jones

885—RYBICKA, K., 1959. [Zakład Parazytologii, Polska Akademia Nauk, Warszawa, Pasteura 3, Poland.] "Tapeworms of forest micromammalians (Rodentia and Insectivora) from Kampinos Wilderness." Acta Parasitologica Polonica, 7 (13/22), 393–422. [Polish summary p. 422.]

The cestodes found in the Kampinos forests in the insectivores Sorex araneus and S. minutus were Hymenolepis singularis, H. furcata, H. stefański, H. tripartita, Vigisolepis spinulosa, Ditestolepis diaphana, Pseudodiorchis kampinosi, Choanotaenia crassiscolex and an immature specimen of Dilepididae, and in the rodents Clethrionomys glareolus and Apodemus flavicollis they were Catenotaenis pusilla, H. horrida, H. muris-sylvatici, Strobilocercus fasciolaris and numerous undiagnosed larvae within white cysts (in the liver of A. flavicollis). A table gives also H. fraterna for A. agrarius [this information is, however, omitted from the text]. Rybicka accepts basically the Hymenolepididae as classified before Spasski's revision. Study of her own material leads her to conclude that H. mathevossianae is a synonym of H. horrida, that in H. furcata variation in the number and size of hooks is not correlated with the host (contrary to Zarnowski's data), that the material described by Kobulej & Versényi in 1953 as Dicranotaenia fülleborni is H. furcata, and that V. barboscolex is a synonym of V. spinulosa as the variation in the number of longitudinal bands of rostellar hooklets cannot be a species character but also as reports of such variation may be due to the difficulty of accurate determination. A table lists all the cestodes found in rodents and insectivores in Poland noting places of their occurrence.

G. I. Pozniak

886—TARANKO-TUŁECKA, H., 1959. [Katedra Parazitologii Wyższa Szkoła Rolnicza, Lublin, ul. Akademicka, Poland.] "Helmintofauna traszki zwyczajnej—*Triturus vulgaris* L. okolic Lublina." Acta Parasitologica Polonica, 7 (13/22), 423–429. [English summary p. 429.]

The helminths found in 100 Triturus vulgaris caught in the Lublin area were Diplodiscus subclavatus, Oswaldocruzia goezei, an unidentified female of Cosmocercidae and Acanthocephalus ranae. T. vulgaris is a new host for D. subclavatus, the remaining three species were found for the first time in this host in Poland.

G. I. Pozniak

887—VIVES, N. & ZELEDÓN, R., 1957. [Facultad de Microbiología, Universidad de Costa Rica.] "Observaciones parasitológicas en ratas de San José, Costa Rica." Revista de Biología Tropical. Universidad de Costa Rica, 5 (2), 173–194. [English summary p. 192.]

Vives & Zeledón (i) annotate the parasites found in 103 rats, mostly *Rattus r. rattus* and some *R. norvegicus*, from San José, Costa Rica and (ii) tabulate the incidence (or absence) of 23 species of helminths as recorded in these rats and rats from eleven other parts of the world.

M. McKenzie

Cytology and Genetics

See also Nos.: 729, 732.

888—CHARMOT, G. & REYNAUD, R., 1959. "Relations entre l'ankylostomose et la drépanocytose." Bulletin de la Societe de Pathologie Exotique, 52 (1), 29-31.

Charmot & Reynaud have studied 50 children who were heterozygous for sickle cell anaemia and 46 who were homozygous. Of the former group 32 were suffering from ancylostomiasis and 26 of these had anaemia requiring hospital treatment; of the latter group only 12 had hookworm ova in the faeces. Amongst 91 children admitted for hookworm anaemia (homozygous SS excluded) 27 were carriers of the sickle cell anaemia trait. The authors conclude that the presence of S-haemoglobin only appears to give partial resistance to infection with hookworms.

Morphology and Anatomy

See also Nos.: 549, 560, 604, 651, 652, 656, 842, 843, 844, 904, 908, 910, 911, 913, 914, 916, 982; Taxonomy—all sections.

889—CARTA, A. & DEIANA, S., 1957. [Istituto di Patologia Generale e Anatomia Patologica Veterinaria della Università di Sassari e Centro di Studio per la Parassitologia Veterinaria del C.N.R.] "Osservazioni sul sistema pronefridiale dei protoscolici di cisti idatiche di ovino al microscopio a contrasto di fase e probabile formula delle cellule a fiamma vibratile." Atti della Società Italiana delle Scienze Veterinarie, 11, 571-572. [English & French summaries p. 572.]

Carta & Deiana report on a study, by phase contrast microscopy, of the protonephridial system of *Echinococcus granulosus*. The hydatid cysts in question were recovered from sheep. It is suggested that the flame-cell formula should be as follows 2(3+3+3+3+2)+1)=30 as two flame-cells were found in the stalks of some protoscoleces.

N. Jones

890—CASAROSA, L., 1957. [Cattedra di Parassitologia Veterinaria.] "Contributo alla conoscenza della cuticola del *Crenosoma striatum* (Zeder 1800)." Annali della Facoltà di Medicina Veterinaria. Pisa, 10, 229–236. [English & French summaries p. 236.]

Casarosa gives a detailed description of the cuticular characteristics of *Crenosoma striatum* with special reference to the cuticular filaments which are found on the tegumental envelope. The filaments are subdivided into "thick" and "thin" types, both of which are continuous in both sexes, extending through approximately the whole body length. They follow the annular folds externally and internally, making circumvolutions around them. Histological examination, with general and selective stains, showed that these filaments are muscular in nature and locomotor in function. The paper is illustrated by photomicrographs.

N. Jones

891—CHABAUD, A. G., 1959. [Institut de Parasitologie, Université de Paris, Faculté de Médecine, Paris.] "Redescription d'Amblyonema terdentatum Linstow 1898, nématode parasite du dipneuste Australien Neoceratodus." Bulletin de la Société Zoologique de France, 84 (2/3), 188–194. Chabaud redescribes the nematode Amblyonema terdentatum Linstow, 1898 and shows it to be very similar to those classified in the genus Falcaustra, particularly in the group "Zanclophorus". As a result the subfamily Amblyonematinae Skryabin et al., 1951 is not accepted. The species is, however, sufficiently distinct to warrant the retention of the genus Amblyonema, of which it is the sole species, because of the form of the head and the structure of the male tail.

W. G. Inglis

892—COUTURIER, A., 1959. "Observations sur les polymorphisme des larves infectieuses chez les Mermithidae (Nématodes)." Comptes Rendus des Séances de l'Académie des Sciences. Paris, 248 (14), 2123-2125.

Couturier points out that mermithid larvae show considerable variation in form from species to species. Some regions of the body stain with carmalum while others do not. The posterior part stains very little and Couturier terms it flagellum (f). He devises a flagellary coefficient $\Phi = f \times 100$ (1=larval length). On the basis of this coefficient, starting with the most primitive,

he has compiled a series with increasing coefficients, viz., Pseudomermis hagmeieri, Tunicamermis melolonthae, Hexamermis sp. and Agamermis cobbi.

J. B. Goodey

893—DAWES, B., 1959. [Department of Zoology, King's College, Strand, London.] "On Cercaria owneae (Hutton, 1954) from Sagitta hexaptera (d'Orbigny) in the Caribbean plankton." Journal of Helminthology, 33 (2/3), 209–222.

Hutton's Metacercaria owreae [for abstract see Helm. Abs., 23, No. 598a] is renamed Cercaria owreae. A new group—diplocercous distome cercaria—is proposed to include this cercaria. It is recorded here in the coelom and gut of Sagitta hexaptera. The cercaria is characterized by the presence of a pair of large posterior appendages attached to the body by a narrow stalk which passes through the excretory pore and joins the wall of the excretory vesicle. Each appendage contains an extension of a gut caecum throughout its length. The sacculate gut caeca fill the body, the epithelial cells of the dilated portions are short and those of the constricted portions tall. A rosette of six small diverticula arises at the anterior end of each caecum.

The cuticle is finely granulated and delicately furrowed. Dawes considers that the extension of the caeca through the excretory vesicle into the appendage indicates that the adult has an anal opening in the wall of the excretory vesicle and belongs to the family Accacoeliidae, The rosette diverticula of the gut suggest that the adult is a member of the genus Accacladocoelium, parasites of Mola mola. B. L. James

894—KORPACZEWSKA, W., 1959. [Department of Parasitology, Warsaw University.] "The adult forms of Echinocotyle druzniensis Jarecka, 1958." Bulletin de l'Académie Polonaise des Sciences. Classe II. Série des Sciences Biologiques, 7 (5), 195–198. [Russian summary pp. xxiii–xxiv.] Korpaczewska describes and figures the hitherto unknown adults of Echinocotyle druzniensis, a species named by Jarecka in 1958 from cysticercoids found in copepods in Lake Družno [for abstract see Helm. Abs., 27, No. 180b]. 1,012 adults were encountered in the small intestine of one Larus fuscus killed on Lake Mamry in 1956. All further efforts to find adult infections at this lake failed and none was found at Lake Druzno. G. I. Pozniak

895—ITO, J., 1959. [Hygiene Laboratory, Faculty of Education, Shizuoka University, Shizuoka, Japan.] "A contribution to the morphology of cercaria of Notocotylus magniovatus Yamaguti, 1934 (Notocotylidae, Trematoda)." Japanese Journal of Medical Science and Biology, 12 (3), 133–137. In a survey of 34,000 fresh-water snails of Semisulcospira spp. in Shizuoka Prefecture, highest infection with the cercaria of Notocotylus magniovatus occurred in medium-sized snails in the suburbs of Shizuoka City. Ito's description enables the cercaria of N. magniovatus to be placed in the Yenchingensis group of notocotylid cercariae. The rediae are yellowish, bear a pair of posterior foot appendages and have less than ten cercariae. The cercaria, which has three conspicuous eve-spots, is opaque because of the presence of rod-like cystogenous material. The anterior fifth of the body and a region around each corner pocket are clear of cystogenous material. The median eye-spot develops last and is smaller than the others; it is partly covered by the short median branch of the excretory bladder. The cercariae encysted in a glass container without the presence of a second intermediate host.

B. L. James

896-ITO, J. & WATANABE, K., 1959. [Hygiene Laboratory, Faculty of Education, Shizuoka University, Shizuoka, Japan.] "Studies on mucoid glands in the cercaria of Notocotylus magniovatus Yamaguti, 1934 (Notocotylidae, Trematoda)." Japanese Journal of Medical Science and Biology, 12 (3), 139-143.

The metachromatic mucoid glands of the cercaria of Notocotylus magniovatus were studied within the redia using Bouin's and Schaudinn's fluids as fixatives and staining with dilute aqueous toluidin blue or thionin solution. Six pairs of body glands, four pairs of dorsolateral glands, one pair of corner pocket glands, ten to fifteen pairs of caudal glands and some strands were detected. These glands do not appear until the eye spots of the cercaria are formed, and they disappear before the cercaria emerges from the redia. Ito & Watanabe suggest that variation in these glands in closely related species may be of taxonomic importance. B. L. James

897—LUBINSKY, G., 1959. [Institute of Parasitology, McGill University, Macdonald College P.O., Quebec, Canada.] "Anomalies of oncotaxy in two species of *Echinococcus* from North America." Canadian Journal of Zoology, 37 (5), 793–801.

Lubinsky discusses anomalies in hook number and structure in adult and larval scoleces of

Echinococcus multilocularis and E. granulosus from North America. The anomalies fall into three main groups: increase in number of hooks, decrease in number of hooks, and transformation of crown into a belt of irregular hooklets and spherules. The author discusses in detail the variations in each category. Oncospheres of E. multilocularis containing two, seven and twelve hooks are described, with a discussion of the probable origin of giant oncospheres. G. A. Webster 898-SCHELL, S. C., 1959. [University of Idaho, Moscow, Idaho, U.S.A.] "The Shipleya enigma."

Transactions of the American Microscopical Society, 78 (4), 352-354. Schell describes and figures the anatomy of specimens of Shipleya inermis obtained from Limnodromus griseus captured in Idaho, and gives details of the ovum which was not illustrated by previous authors. He concludes that this cestode is protandrous; that the transition from male to female reproductive organs is quite rapid; and that therefore most strobilae are composed of proglottides with either male or female reproductive organs, only a few bearing transitional proglottides in which female reproductive organs are starting their development.

899—SENEVIRATNA, P., 1959. [Department of Veterinary Pathology, University of Ceylon, Peradeniya, Ceylon.] "Studies on Anafilaroides rostratus Gerichter, 1949 in cats. I. The adult

and its first stage larva." Journal of Helminthology, 33 (2/3), 99–108. Seneviratna redescribes Anafilaroides rostratus from specimens collected from the peribronchial tissue and the bronchial wall of cats in the Kandy district of Ceylon. The specimens closely resemble those described from cats in Palestine but the oesophagus of males is larger and the gubernaculum smaller. The original account is amplified by descriptions of the anterior end and of the excretory system. Of the four pairs of cephalic papillae on the outer circle, the latero-dorsal and the latero-ventral pairs are more prominent than the ventroventral and dorso-dorsal pairs; the three pairs of papillae in the inner circle are rudimentary. The excretory opening, guarded by three prominences, is on the ventral surface a short distance behind the oral opening. The excretory system consists of three vesicles, each with a large excretory cell. The vesicles differ in size but their relative sizes are the same in both sexes. The first-stage larvae were collected from the lungs and the alimentary canal. The former were the same size as those previously described but the larvae in the faeces were somewhat larger. It is concluded that growth occurs during passage in the faeces. The larvae were found to be susceptible to heat, cold and desiccation. Lysol, copper sulphate and borax were all larvicidal, lysol being the most toxic and borax the least so.

900—TANDON, R. S., 1958. [Department of Zoology, Lucknow University, India.] "Studies on the excretory system of amphistomes of ruminants: I. Carmyerius spatiosus (Stiles & Goldberger, 1910)."

Proceedings of the National Academy of Sciences, India. Section B, 28 (5), 340–344.

Tandon studied the excretory system of Carmyerius spatiosus from buffaloes slaughtered at the Lucknow abattoir. Adult specimens fixed in acidic corrosive sublimate and living immature worms were used. The main ducts are H-shaped, with the horizontal bar in the anterior part of the body. The two longitudinal ducts open into the excretory bladder on its ventral surface and receive a large number of branches from the oral sucker, oesophagus, gut caeca, reproductive organs, body wall and acetabulum. The capillaries form an anastomosing system around the gut etc. and end in flame cells. The ducts contained transparent fluid with small, rounded transparent bodies.

S. Willmott

901—ZAKHRYALOV, Y. N., 1956. [Supplements to the description of certain helminths of pigs.] Trudi Instituta Zoologii. Akademiya Nauk Kazakhskoi SSR., 5, 112-119. [In Russian.] Zakhryalov has carefully studied, on a large number of specimens, the morphological variation of Ascarops strongylina and Oesophagostomum dentatum. In A. strongylina he figures and describes in great detail the structure of the spicules, which was considerably more complex than previously accepted, and was able to establish for the first time the presence of a gubernaculum. Diagnoses of Ascarops, of which A. strongylina is type, assume its absence. In O. dentatum he observed and describes considerable diversity in the position and shape of the female sex organs, which are used for the diagnosis of the genus, and in the shape of the dorsal ray and the size of the spicules and gubernaculum. [This paper was mentioned by title only in Helm. Abs., 25, No. 865f.]

Life-Cycle and Development

See also Nos.: 473, 633, 645, 656, 724, 728, 824, 825, 830, 833, 836, 837, 840, 848, 938, 946.

902—BESSONOV, A. S., 1958. [Study on the life-cycle of Ostertagia ostertagi from cattle.] Byulleten Nauchno-Tekhnicheskoi Informatsii Vsesoyuznogo Instituta Gelmintologii im. Akademika K.I. Skryabina, No. 4, pp. 1–11. [In Russian.]

The development of Ostertagia ostertagi has been studied experimentally. The optimum temperature for the development of eggs and larvae in cattle faeces was 30°C. In these conditions, the first infective larvae were found after five days and all had reached the infective stage by the 13th day. The three larval stages are described. In the calf, larvae reached maturity 22 to 25 days after infection, but the development of some of the larvae from an autumn infection was delayed for up to five months. The life span of adult worms (originating from an autumn infection) was 234 days in one case and 317 days in another. Egg production soared to a peak in April and May, then dropped and ceased in Iune and Iuly.

G. I. Pozniak

903—ENIGK, K. & STICINSKY, E., 1959. [Institut für Parasitologie und vet.-med. Zoologie der Tierärztlichen Hochschule, Hannover.] "Die Zwischenwirte der Hühnerbandwürmer Raillietina cesticillus, Choanotaenia infundibulum and Hymenolepis carioca." Zeitschrift für Parasitenkunde, 19 (3), 278–308.

Enigk & Sticinsky list 95 species (Musca domestica, two species of Locustidae and 92 species of Coleoptera) reported from various countries as being intermediate hosts of Raillietina cesticillus, Choanotaenia infundibulum or Hymenolepis carioca, with references to the literature. They themselves fed proglottides of these three cestodes to 97 species of Coleoptera, Diptera, Formicidae, Orthoptera, Collembola, Myriapoda, Acarina or Crustacea (Porcellio, Armadillidium). They found that in their district (Hanover, Germany) for H. carioca, the chief intermediate hosts are Scarabaeidae, but the cysticercoids also develop in *Niptus hololeucus* (Ptinidae). Contrary to reports in the literature, they could not infect species of Carabidae. They found, as new intermediate hosts of this cestode, Geotrupes silvaticus, Aphodius fossor, Sphaeridium bipustulatum, S. scarabaeoides and N. hololeucus. For R. cesticillus and C. infundibulum, the chief intermediate hosts in mid-Europe are species of the genera Amara and Calathus; less favourable are some species only of the genera Carabus, Pterostichus and Harpalus, species of other genera playing an unimportant part. For R. cesticillus the chief intermediate hosts are Carabidae and Scarabaeidae, but some species of Tenebrionidae, Dermestidae, Ptinidae, Silphidae and Otomidae could also be infected. New intermediate hosts of this cestode were eight species of Carabidae, two of Scarabaeidae and one species of Dermestidae, Ptinidae and Silphidae. C. infundibulum has a wider range of intermediate hosts; they include species of Carabidae, Scarabaeidae, Tenebrionidae, Dermestidae, Ptinidae, Dytiscidae, Curculionidae and Staphylinidae and its cysticercoids also develop in adult Musca domestica (but not in the larvae of this fly), in two species of Orthoptera and in one species of termite. For the names of the species concerned the paper itself must be consulted. Infection of beetle larvae is possible, but the larvae of M. domestica could not be infected. On farms cestode infection is spread by bacon beetles, meal beetles and Ptinidae. The intermediate hosts of C. infundibulum usually harbour only a few cysticercoids, but the less numerous intermediate hosts of Hymenolepis carioca always harbour heavier infections with them. The cysticercoids are described. Excepting eight species of arthropods, which were reared in the laboratory by the methods described, the 97 other species used were collected from places far removed from poultry G. Lapage farms.

904—GALLATI, W. W., 1959. [Department of Science, Indiana State Teachers College, Indiana, Pennsylvania.] "Life history, morphology and taxonomy of Atriotaenia (Ershovia) procyonis (Cestoda: Linstowiidae), a parasite of the raccoon." Journal of Parasitology, 45 (4), 363–377.

Oochoristica procyonis Chandler, 1942 has been referred by Gallati to Atriotaenia (Ershovia) procyonis (Chandler, 1942) Spasski, 1951 following an examination of a fresh series of specimens from raccoons in Franklin County, Ohio. An illustrated redescription of the tapeworm is presented, resulting in a more complete definition of the species limits. Descriptions and illustrations of the morphology and development of oncosphere, cysticercoid, and adult are presented. The life-history of this cestode, utilizing Tribolium castaneum as the intermediate host, was experimentally determined to be as follows: eggs contain fully formed oncospheres when passed with faeces of the raccoon; oncospheres are probably freed from the

egg-shell by the mouthparts of the beetle, almost immediately penetrate the mid-gut (the initial stages of penetration were not recovered), and are found in the haemocoel of the insect 38 hours after feeding; cysticercoids are mature and infective in 10 days, and gravid proglottides are passed by the raccoon 12 days after ingestion of such cysticercoids.

E. I. Sillman

905—KISIELEWSKA, K., 1959. [Zakład Parazitologii, Polska Akademia Nauk, Warszawa, Pasteura 3, Poland.] "Types of Copepoda and *Drepanidotaenia lanceolata* (Bloch) host-parasite systems established experimentally." Acta Parasitologica Polonica, 7 (13/22), 371–392. [Polish summary pp. 391–392.]

Kisielewska attempts to classify host-parasite systems basing herself on the concrete example of Copepoda and *Drepanidotaenia lanceolata* larvae. Thus, using as criteria the rate and intensity of infection, behaviour of larvae in the host intestine, speed and course of larval development and intra-population relationships, she distinguishes four types of system—obligatory, auxiliary, accidental and spurious. A strict application of this classification presents difficulties in practice as the same host may change its role with the seasons. In the spring and summer obligatory and auxiliary systems predominated involving, for example, *Cyclops strenuus strenuus*, *Mesocyclops leuckarti*, *Acanthocyclops bicuspidatus*, *A. viridis* and *Eucyclops macrurus*, while in the autumn and winter accidental and spurious systems were numerically more frequent involving, for example, *C. strenuus strenuus*, *Macrocyclops fuscus*, *M. albidus*, *A. viridis*, *E. surratulus*, *E. macrurus*, *E. macruroides* and *E. speratus*.

G. I. Pozniak

906—LEE, H. H. K., JONES, A. W. & WYANT, K. D., 1959. [Department of Zoology & Entomology, University of Tennessee, Knoxville, Tennessee, U.S.A.] "Development of the taeniid embryophore." Transactions of the American Microscopical Society, 78 (4), 355-357.
 Lee et al. investigated the development of the embryophore in eggs of Taenia saginata. During

Lee et al. investigated the development of the embryophore in eggs of Taenia saginata. During early cleavage, the oncosphere primordium is surrounded by four to six giant nuclei within a membrane that appears to be continuous with the undivided secondary macromere. As the oncosphere differentiates, the embryophore primordium begins to form as a thin granular membrane just peripheral to the giant nuclei which, with their associated cytoplasm, probably supply material for its development. This membrane thickens and granular aggregates form within it, which are transformed into the prismatic rods of the mature embryophore. At completion of development the giant nuclei have disappeared, leaving only a featureless, transparent layer between embryophore and oncosphere. The authors conclude that the developing embryophore is a secretory product, the outer part of which reaches its final form by some sort of crystallization which proceeds inwards until the characteristic striated membrane is complete.

J. M. Watson

907—LOOF, P. A. A., 1959. [Landbouwhogeschool, Wageningen, Nederland.] "Ueber das Vorkommen von Endotokia matricida bei Tylenchida." Nematologica, 4 (3), 238–240. [English summary p. 240.]

Loof describes and figures two instances in the Tylenchida of "Endotokia matricida", the failure of normally oviparous nematodes to deposit their eggs which may then accumulate and continue development within the body. In one case a live, hatched larva was found within a dead *Aphelenchoides fragariae*. The other instance concerned a fixed specimen of *Pratylenchus coffeae* containing a hatched larva. These are claimed to be the first records of this phenomenon outside the family Rhabditidae.

R. D. Winslow

908—NISHIMURA, N., 1959. [Department of Parasitology, Gifu Prefectural Medical School, Gifu, Japan.] [Studies on Trichostrongylus triramosus. IV. On the development of T. triramosus larvae in vitro.] Acta Scholae Medicinalis in Gifu, 7 (3), 778–784. [In Japanese: English summary p. 778.]

Soon after hatching, the larva of *Trichostrongylus triramosus* took a rhabditis form. The internal structures of the body were not distinct, but each anlage of cephalic glands, excretory system, oesophageal glands, cervical gland and lateral line could be recognized. After five to six days of culture, larvae were encysted and took filaria forms. Their secretory and excretory systems were similar to that of the adult worm.

Y. Yamao

909-PAETZOLD, D., 1958. "Bemerkungen zur 'Endotokia matricida' von Lordello 1951." Wissenschaftliche Zeitschrift der Martin-Luther-Universität Halle-Wittenberg. Mathematisch-

Naturwissenschaftliche Reihe, 7 (1), 81-83.

Paetzold observed the occurrence of the phenomenon "Endotokia matricida" in Rhabditis (Pellioditis) sp., where normally oviparous females, possibly affected by malnutrition or other adverse factors, failed to deposit their eggs. These continued to develop within the uterus, giving rise to larvae which entered the body-cavity, eventually escaping from the dead parent to develop normally. The literature on the subject is reviewed. R. D. Winslow

910—SCHILLER, E. L., 1959. [Department of Pathobiology, School of Hygiene and Public Health, Johns Hopkins University, Baltimore, Maryland, U.S.A.] "Observations on the morphology and life cycle of *Microphallus pirum* (Afanas'ev, 1941)." Transactions of the American Microscopical Society, 78 (1), 65–76.

Schiller has obtained sexually mature adults of Microphallus pirum in Mesocricetus auratus, Vulpes vulpes alascensis and Alopex lagopus innuitus by feeding to them metacercariae from Pagurus hirsutiusculus, and in Larus glaucescens by feeding infected hermit crabs (removed from their shells). Comparison of the morphology of the experimentally obtained adults with those from naturally infected Enhydra lutris indicate that the mean body size varies with the host and that the oral sucker, acetabulum and oesophagus are proportional to the body size. Eggs from the infected gulls were used to infect Thais emarginata which proved to be a satisfactory first intermediary. The larval stages are described and the paper is illustrated by line drawings and photomicrographs. S. Willmott

911—SENEVIRATNA, P., 1959. [Department of Veterinary Pathology, University of Ceylon, Peradeniya, Ceylon.] "Studies on Anafilaroides rostratus Gerichter, 1949 in cats. II. The life cycle."

Journal of Helminthology, 33 (2/3), 109-122.

Seneviratna describes the development of the larval stages of Anafilaroides rostratus in molluscs and in cats. Of the molluscs experimentally infected, development occurred in two slugs (Laevicaulis alte and Mariella dussumieri) and one snail (Achatina fulica) from Ceylon and in one snail (Helix aspersa) from England. Development in L. alte maintained at 24°C.-30°C. takes 28-29 days, the larvae developing in the foot of the host and only the infective larvae occasionally invading other parts of the body. The first moult is completed in 13–14 days and the second moult is completed by the 20th day. During development, the larvae can be identified by the size, a characteristic kink in the tail, the size of the oesophagus and the structure of the buccal capsule. Mice, chickens and possibly rats can act as auxiliary hosts, in which the third-stage larvae become encysted. In cats, the infective larvae penetrate the stomach wall and migrate to the lungs. Two moults occur and immature adults were found 46 days after infection; gravid females were found after 74 days and larvae were found after 78 days. It is believed that the adults live for more than a year. P. Williams

912-SOGANDARES-BERNAL, F. & HUTTON, R. F., 1959. [Florida State Board of Conservation Marine Laboratory, Maritime Base, St. Petersburg, Florida.] "The identity of metacercaria B reported from the pink shrimp, *Penaeus duorarum* Burkenroad, by Woodburn et al. in 1957." **Journal** of Parasitology, 45 (4), 362, 378.

Metacercaria B encysting in the connective tissue and muscles of Penaeus duorarum is a member of the genus Microphallus. Experimental attempts at producing the adult by feeding cysts to B. L. James hamsters failed.

913-WAKASUGI, M., 1958. [Studies on the filaria of the cotton rat, Litomosoides carinii. 3. The morphology of the adult and microfilariae and their development in the rat mite, Ornithonyssus bacoti.] Japanese Journal of Parasitology, 7 (5), 514–522. [In Japanese: English summary

Wakasugi describes the morphology of the microfilaria and adult of Litomosoides carinii. Development of the parasite in the rat mite was followed. The time needed for the microfilariae to become infective after the rat mite had taken a blood meal varied greatly under different conditions. The shortest time seemed to be about two weeks. Y. Yamao

914—WHARTON, R. H., 1959. [Institute for Medical Research, Kuala Lumpur, Federation of Malaya.] "Dirofilaria magnilarvatum Price, 1959 (Nematoda: Filarioidea) from Macaca irus Cuvier. IV. Notes on larval development in Mansonioides mosquitoes." Journal of Parasitology, 45 (5), 513–518.

Mansonia (Mansoniodes) longipalpis and M. uniformis were allowed to feed on a monkey infected with Dirofilaria magnilarvatum and Wuchereria malayi. Fewer mosquitoes became infected with D. magnilarvatum than with W. malayi, and the numbers of microfilariae of D. magnilarvatum taken up by individual mosquitoes were not related to the numbers estimated to be in the blood of the monkey. The larvae of D. magnilarvatum developed in the Malpighian tubules. In M. longipalpis third-stage larvae were found 10.5 days after the mosquitoes had fed and most larvae had reached the third stage after 12.5 days. In M. uniformis no third-stage larvae were found after 10.5 days, but third-stage larvae were found in one mosquito after 13.5 days. The larvae were 960-1095 \(\theta \) in length. The terminal caudal papilla was pointed and flanked on either side by a small secondary pointed papilla, whereas in the larvae of D. immitis, which they otherwise resemble, there is usually only one blunt papilla.

W. A. F. Webber

915—YAMASHITA, J., OHBAYASHI, M. & KITAMURA, Y., 1958. [Department of Parasitology, Faculty of Veterinary Medicine, Hokkaido University, Sapporo, Japan.] "Studies on echinococcosis. VII. On the development of *Echinococcus multilocularis* in the tapeworm stage." Japanese Journal

of Veterinary Research, 6 (2), 89-92.

Yamashita et al. studied the development of Echinococcus multilocularis, which they obtained by experimental infection of a dog with hydatid cysts from Clethrionomys rutilus and then infecting C. rufocanus bedfordiae with eggs of the parasite passed in the faeces of this dog. The infection was then passed on to two more dogs. Adult worms were almost sexually mature on the 15th day after infection. The first eggs were found in the faeces of the infected dogs on the 30th and 35th days after infection. Comparing these results with those of a previous experiment, the authors conclude that E. multilocularis matures earlier than E. granulosus.

N. Jones

916—YAMASHITA, J., OHBAYASHI, M. & KITAMURA, Y., 1958. [Department of Parasitology, Faculty of Veterinary Medicine, Hokkaido University, Sapporo, Japan.] "Studies on echinococcosis. IX. Differences in development of the tapeworm stage between *Echinococcus granulosus* (Batsch, 1786) and *E. multilocularis* Leuckart, 1863." Japanese Journal of Veterinary Research, 6 (4), 226–229.

Yamashita et al. describe the developmental differences between Echinococcus granulosus and E. multilocularis while referring to two previous experiments [for abstracts see Helm. Abs., 25, No. 432c and No. 915 above]. The morphological and developmental differences observed in the strobila, rostellum, rostellar hooks, suckers and genitalia agreed with the observations of Vogel.

N. Jones

Bionomics

See also Nos.: 540, 567, 571, 582, 636, 645, 658, 699, 700, 710, 716, 717, 724, 725, 733, 734, 739, 749, 760, 790, 823, 828, 829, 832, 835, 839, 841, 847, 849, 902, 905.

917—AGOSÍN, M. & ARAVENA, L., 1959. [Departamento de Parasitología, Universidad de Chile.] "Enzimas del ciclo de las pentosas en *Echinococcus granulosus*. Communicación preliminar."

Boletín Chileno de Parasitología, 14 (2), 30-33. [English summary p. 30.]

The experiments reported in this paper using liquid extracts of the scoleces of hydatid larvae and ketonic powders of *Echinococcus* suggested that the larva possesses several enzymes which act on glucose along the lines of the pentose cycle. It is pointed out that other work by the authors (in the press) and the present studies seem to exclude the possibility that any other known method of breaking down glucose is operative since there was no evidence of enzyme activity related to the non-phosphorylative oxidation of carbohydrates.

M. McKenzie

918—BEČEJAC, Š. & LUI, A., 1959. [Zavod za biologiju Veterinarskog fakulteta Sveučilišta, Zagreb.l "O djelovanju temperature i kisika na razvoj jaja velikog metilja (Fasciola hepatica L.)." Veterinarski Arhiv, 29 (90), 293–301. [English & French summaries pp. 300–301.]

Bečejac & Lui studied the influence of temperature and oxygen on the development of Fasciola hepatica eggs. Incubation temperatures were -5°C., 25°C. and 40°C. It was found that: (i) developmental activity at 40°C. depended on the amount of oxygen; (ii) eggs died after four days in distilled water at 40°C. and saturated with oxygen, but they continued their development if the temperature was lowered to 25°C.; (iii) at 0.84 mg. per litre to 1.19 mg. per litre of oxygen and at 40°C. the development was inhibited, but eggs remained potentially capable of developing for as long as 13 days; (iv) in water saturated with oxygen the eggs died when the temperature was raised from 25°C. to 40°C. but their viability was preserved for several days if the quantity of oxygen was reduced; (v) miracidia appeared with a little delay from eggs incubated in water with 0.78 mg. per litre to 3.17 mg. per litre of oxygen and at 25°C. but the eggs died if the oxygen content was reduced to 0.2 mg. per litre; (vi) the optimum temperature was 25°C.—30°C., satisfactory development resulting from favourable interaction of oxygen and temperature and the latter having dominant and positive effect; (vii) -5°C. was lethal. The pre-developmental and final stages were found to be the least resistant.

N. Jones

919—BESSONOV, A. S., 1958. [Study of the development of Ostertagia ostertagi larvae and their resistance under field conditions in the West Kazakhstan region.] Byulleten Nauchno-Tekhnicheskoi Informatsii Vsesoyuznogo Instituta Gelmintologii im. Akademika K.I. Skryabina, No. 4, pp. 20–24. [In Russian.]
Under the conditions of West Kazakhstan, Ostertagia ostertagi larvae developed to the infective

Under the conditions of West Kazakhstan, Ostertagia ostertagia larvae developed to the infective stage from April to September inclusive, and most quickly in July (in seven to eight days). Infective larvae in faecal samples could survive the winter on pasture and remained viable for up to one year. Eggs were killed by cold conditions. Bessonov suggests that sterility of pastures from O. ostertagi may be achieved by not grazing cattle for at least one year and gives the most suitable times during the year for changes of pasture.

G. I. Pozniak

920—BONO, G. DEL, 1957. [Cattedra di Parasstiologia della Università di Pisa e Centro Veterinario di Idatidologia di Pisa.] "Ricerche sulla sopravvivenza dei protoscolici echinococcici. (Nota preventiva)." Atti della Società Italiana delle Scienza Veterinarie, 11, 712–713. [English & French summaries p. 713.]

Bono records that research is being carried out on the survival of the protoscoleces of *Echinococcus* in the following media *in vitro*: (i) bovine bile; (ii) liquid medium with a high bacterial content; (iii) bovine liver and lung medium to which antibiotics had been added; (iv) water. Research on the survival of protoscoleces and cysts left in the viscera, but subjected to different conditions, was also carried out.

N. Jones

921—CASAROSA, L., BONO, G. DEL & PELLEGRINI, N., 1957. [Istituto di Patologia Generale e Anatomia Patologica Veterinaria e Centro di Idatidologia.] "Sopravvivenza dei protoscolici di cisti echinococciche ubicate in fegati ed in polmoni ovino posti in condizioni diverse. (Immersione in acqua corrente, immersione in salamoia, inumazione, esposizione all'aria ed alla luce solare diretta.)" Annali della Facoltà di Medicina Veterinaria. Pisa, 10, 89–96. [English & French summaries p. 94.]

Casarosa et al. subjected entire and bisected lungs and livers of sheep, containing hydatid cysts, to different conditions. Protoscoleces survived for three to six days in spring water (average temperature 14°C.). When buried at 40 cm. to 60 cm. depth and at temperatures of 22°C., 15°C. and 10°C. protoscoleces survived for 120 to 200 hours. Their ability to survive in lungs and livers of sheep while these were exposed to the air, and direct sunlight, ranged between 120 and 228 hours. In 20% salt solution protoscoleces in intact cysts in tissue remained viable in their natural media for 32 to 65 hours. In every case the ability to survive was greater in the case of protoscoleces from pulmonary hydatid cysts and when cysts were preserved in whole viscera.

922—CAVIER, R. & SAVEL, J., 1959. "Les réactions de phosphorylation liées au métabolisme glucidique chez Ascaris lumbricoides Linné, 1758." International Congress of Zoology (15th) London,

July 16–23, 1958. Proceedings, pp. 937–938.
Cavier & Savel discuss briefly work on the synthesis and breakdown of glycogen in Ascaris lumbricoides. "Phosphorylase" which had a pH optimum of 5.8 was found, in order of decreasing activity, in the body wall, ovary, intestine and testis. The effect of different sugars on the synthesis of glycogen of worms cultured in vitro is discussed in relation to hexokinase.

W. P. Rogers

923—ELLISON, T., 1959. [University of Wisconsin, U.S.A.] "The nutritional requirements and excretory products of axenic Ascaris lumbricoides var. suis." Dissertation Abstracts, 20 (3), 870. Ellison maintained Ascaris lumbricoides for a maximum of 50 days with a mean survival of 36·2 days in a synthetic medium consisting of basal salts, glucose (0·2%), 20 L-amino-acids and 12 water-soluble vitamins in a phosphate buffer (pH 7·2). Axenic conditions were maintained by addition of mixtures of antibiotics. Deficiency of tryptophan, phenylalanine, cysteine, threonine, arginine, lysine, histidine, tyrosine, methionine, glutamic acid, leucine, alanine or serine led to significant decrease in the survival of the worms. The following three volatile fatty acids were identified as major excretory products: α-methyl n-butyric, isovaleric and isocaproic. Minor excretory products included acetic, propionic, iso-butyric, n-butyric, cis-α-methyl crotonic (tiglic) and n-caproic acids together with an unknown, branched C₇ acid. Some investigation of the effects of nutritional requirements upon the chemical composition of the worms in axenic culture was also carried out.

J. M. Watson

924—EMDIN, R., 1957. [Istituto di Patologia Generale e Anatomia Patologica Veterinaria e Centro di Idatidologia.] "Sulla sopravvivenza in vitro dei protoscolici echinococcici. Sopravvivenza in mestrui liquidi ad alto contenuto microbico." Annali della Facoltà di Medicina Veterinaria. Pisa, 10, 85-88. [English & French summaries p. 88.]

Emdin reports that protoscoleces, recovered from pulmonary and hepatic hydatid cysts in sheep, preserve their viability (i) in blood serum, containing aerobic and anaerobic microbes for 24 hours at 38°C. and for 32 to 44 hours at room temperature, (ii) in aqueous media from lungs affected by fibrinous pneumonia for 24 hours at both room temperature and 38°C., and (iii) in aqueous suspension of bovine and sheep faeces for 20 to 24 hours at 38°C. and for 24 to 32 hours at room temperature.

N. Jones

925—FASSULIOTIS, G., 1958. "Effects of ionizing radiations on the golden nematode, *Heterodera* rostochiensis." [Abstract of paper presented before the Radiation Research Society, 1958.] Radiation Research. New York, 9 (1), 112-113.

Irradiation of cysts of the potato-root eelworm, *Heterodera rostochiensis*, with X-rays and γ -rays resulted in a delay in the onset of hatching and a reduction in the total number of larvae emerging, when the dose exceeded 160 kr. No larvae hatched after 640 kr. Injury resulting in abnormal body movements became apparent after 80 kr. Females developing from larvae which had received a dose of 80 kr. were all sterile. Chromosome aberrations were also found in eggs recovered from females which developed from irradiated larvae.

H. R. Wallace

926—GEBAUER, O., 1958. [Städtischen Schlachthof Leoben.] "Kalk und seine Beziehungen zur Leberegelbekämpfung. Vorläufige Mitteilung." **Archiv für Experimentelle Veterinärmedizin,** 12 (1), 79–81.

Gebauer bred Fasciola hepatica miracidia in tap-water at a pH of 7.8. As a result of adding lime water containing 0.16% calcium hydroxide the miracidia started swimming in curves; after some time these movements stopped and the miracidia sank to the bottom, became pyriform and were recognizable only by the eye spots. The time taken to complete the above process depended on the quantity of lime water added. Motility stopped after 20 seconds in a concentration of 10% lime water and after 90 minutes at half this concentration. At a concentration of one part of lime water in 30 parts tap-water miracidia were disintegrated after 19 hours and most of their movements stopped after 150 minutes; the pH of this medium was 8.6. In another experiment, where embryonated eggs of the liver-fluke had been kept in

water at pH 9, miracidia appeared within 12 hours of adding distilled water to the medium. The author also reports that a pH of 8.5, resulting from liming a fish pond, did not affect the life and snails in it or the fish.

N. Jones

927—HAWKING, F., 1959. [National Institute for Medical Research, Mill Hill, London, N.W.7.] "Dirofilaria magnilarvatum Price, 1959 (Nematoda: Filarioidea) from Macaca irus Cuvier. III. The behavior of the microfilariae in the mammalian host." Journal of Parasitology, 45 (5), 511–512.

Hawking has studied the behaviour of the microfilariae of *Dirofilaria magnilarvatum* in two *Macaca irus* monkeys. The numbers of microfilariae in the peripheral blood were irregular and there was no evidence of diurnal periodicity. 0–11 and 1–4 microfilariae per 20 cu. mm. were found in blood from the ear of the two monkeys, but up to 165 and 190 microfilariae per 20 cu. mm. were found in blood taken from the tail after it had been allowed to hang down. The numbers of microfilariae in the blood were not influenced by anaesthetization of the monkeys, by letting them breathe oxygen, 10% oxygen in nitrogen or high concentrations of carbon dioxide, or by exercising them. Microfilariae were found in arterioles in sections of skin from the dorsum of the foot and from the end of the tail, but not in venules or capillaries.

W. A. F. Webber

928—HILLIARD, D. K., 1959. [Arctic Health Research Center, Public Health Service, U.S. Department of Health, Education, and Welfare, Anchorage, Alaska.] "The effects of low temperatures on larval cestodes and other helminths in fish." Journal of Parasitology, 45 (3), 291–294.

Hilliard subjected specimens of fresh-water fishes containing helminth parasites to temperatures of -6° C., -12° C. and -18° C. Following exposures of 24, 48 or 72 hours, the fishes were immersed in warm water (30° C.) until sufficiently pliable for the viscera to be removed. Plerocercoid larvae and nematodes (*Porrocaecum* sp. and a spirurid) were removed from their cysts and placed in $0.4^{\circ}_{.0}$ physiological saline. Non-viability of the organism was established if no movements occurred following a five minute exposure to the saline solution. It was found that larvae of different species of the genus *Diphyllobothrium* differed in their range of tolerance to cold. The most resistant plerocercoid larvae on a host-weight basis, were those of *D. osmeri* which tolerated freezing temperatures for 48 hours at -6° C. and for 24 hours at -12° C. in a host averaging 52 gm. No viable helminths were recovered after exposure for two days to a temperature of -18° C.

929—KOBAYASHI, A. ET AL., 1959. [Department of Parasitology, Gifu Prefectural Medical School, Gifu, Japan.] [Studies on excystation of the metacercaria of Metagonimus yokogawai.] Acta Scholae Medicinalis in Gifu, 7 (3), 822–828. [In Japanese: English summary p. 822.]

Metacercariae of Metagonimus yokogawai had little resistance to desiccation. However, they lived for over six days both in distilled water and in physiological saline solution at 0° C., for 96 hours at 20° C. and for 48 hours at 37° C. Pepsin and pancreatin had no power of inducing ecdysis of the metacercariae, but pig bile could induce ecdysis. The metacercariae could live more than 96 hours at pH 2.6 to 9.2.

Y. Yamao

930—MANSOUR, T. E., 1959. [Department of Pharmacology, School of Medicine, Louisiana State University, New Orleans, Louisiana.] "Actions of serotonin and epinephrine on intact and broken cell preparations from the liver fluke, Fasciola hepatica." Pharmacological Reviews, 11 (2, Pt. 2), 465–466.

Mansour determined phosphorylase activity in cell-free homogenates of Fasciola hepatica cultured with serotonin and found that it was increased as compared with similar preparations lacking this indolalkylamine. Serotonin was also found to stimulate the synthesis of the nucleotide, cyclic 3,5-AMP, in particulate preparations from the liver-fluke, when incubated with ATP and Mg; whereas epinephrine, under the same conditions, did not have this effect. He suggests that serotonin may stimulate both glycogenolysis and glycolysis; and that it, or a related compound, may play the same role in the carbohydrate metabolism of the liver-fluke that epinephrine plays in that of higher organisms. [These remarks were made in the course of the discussion on one of the papers read at the Symposium on Catecholamines held at the National Institutes of Health, Bethesda, Maryland, October 16–18, 1958.] J. M. Watson

931—NOSIKOV, V. P., 1958. [Some observations on the biology of strongylates from the digestive tract of sheep in the Leningrad region.] Sbornik Rabot. Leningradski Veterinarni Institut, 21,

245–252. [In Russian.] Larvae of various intestinal strongylates of sheep, when placed in faeces on pasture, reached the infective stage in 10 to 12 days during May and August and in 8 to 9 days during June and July. In September only 57% of larvae were infective after the 15th day. Small numbers of Trichostrongylus larvae survived for up to 105 days and larvae of Ostertagia, Bunostomum and Haemonchus for 72 days. During the winter eggs in faecal samples on pasture died within 16 to 33 days but a few infective larvae survived for over 155 days (December to May).

G. I. Pozniak

932—PELLEGRINI, N. & BONO, G. DEL, 1957. [Istituto di Patologia Generale e Anatomia Patologica Veterinaria e Centro di Idatidologia.] "Sulla sopravvivenza in vitro dei protoscolici echinococcici. Sopravvivenza in bile di bovino e ovino." Annali della Facoltà di Medicina Veterinaria.

Piŝa, 10, 69-73. [English & French summaries p. 72.]
Pellegrini & Bono report that echinococcal protoscoleces, extracted from bovine and ovine pulmonary and hepatic cysts, and put into bovine and ovine bile at 15°C. and 18°C. respectively, survived for over 31 hours and 47 hours. At 38°C. protoscoleces survived for six to twelve hours. In cases where the bile was renewed every six to twelve hours, protoscoleces survived for up to 120 hours at room temperature and up to 36 hours at 38°C. N. Jones

933—PELLEGRINI, N. & BONO, G. Del., 1957. [Istituto di Patologia Generale e Anatomia Patologica Veterinaria e Centro di Idatidologia.] "Sulla sopravvivenza in vitro dei protoscolici echinococcici. Sopravvivenza in mestrui antibiotati preparati con fegato e con polmone di ovino." Annali della Facoltà di Medicina Veterinaria. Pisa, 10, 74–77. [English & French summaries p. 77.]

Pellegrini & Bono placed hydatid protoscoleces in media prepared from sheep liver and lungs, diluted in physiological saline with the addition of 2,000 units of penicillin. The media were renewed every 24 hours. Protoscoleces remained viable for 96 hours at 38°C. and for 136 hours at room temperature. They retained their viability for 100 hours and for 112 hours at 38°C. and room temperature respectively when water instead of physiological saline was used to dilute the visceral samples.

N. Jones

934—PELLEGRINI, N. & BONO, G. Del., 1957. [Istituto di Patologia Generale e Anatomia Patologica Veterinaria e Centro di Idatidologia.] "Sulla sopravvivenza in vitro dei protoscolici echinococcici. Sopravvivenza di protoscolici echinococcici in soluzione fisiologica, in soluzione di NaCl, in acqua di fonte, piovana, di fiume, di mare, in acque luride di cella di mattazione." Annali della Facoltà di Medicina Veterinaria. Pisa, 10, 78–84. [English & French summaries pp. 83–84.]

Pellegrino & Bono experimented on the viability of echinococcal protoscoleces in different media at a mean temperature of 15° C. The average time during which protoscoleces remained viable was: (i) two hours in spring water (pH 7·2) and in rain water (pH 5 to 6); (ii) 55–65 hours in river water (pH 6·5 to 6·9); (iii) less than two hours in sea water (pH 5); (iv) 44–48 hours in physiological solution; (v) slightly longer in sodium chloride solution (5%) than in sea water; (vi) 50–60 hours in abattoir drain water. In the last-mentioned case the viability was reduced when drain water was diluted with spring water.

N. Jones

935—RAO, K. H. & JENNINGS, J. B., 1959. [Department of Zoology, University of Leeds, U.K.] "The alimentary system of a pentastomid from the Indian water-snake *Natrix piscator Schneider.*" Journal of Parasitology, 45, (3), 299–300.

Rao & Jennings found Raillietiella agcoi in the lung of the water-snake Natrix piscator, a previously unrecorded host for this species, and made observations on its alimentation. Digestion of blood drawn from the lung capillaries took place in the mid-gut, which was provided with enzyme-secreting and iron-secreting cells. The former are responsible for the mainly intraluminar process of digestion, which results in rapid haemolysis of erythrocytes and the appearance of numerous haematin granules. The latter, which become charged with haematin granules and probably deal with haemoglobin when it is absorbed from the lumen unchanged by breaking it down to a colourless iron compound intracellularly, are extruded into the lumen to pass out intact with the faeces. These digestive processes are said to be similar to those occurring in the haematophagous larva of Gasterophilus and in Rhodnius.

J. M. Watson

936—READ, C. P., 1959. [Department of Pathobiology, Johns Hopkins University, Baltimore, Md., U.S.A.] "The role of carbohydrate in the biology of cestodes. VIII. Some conclusions and hypo-U.S.A.] "The role of carbohydrate in the biology of cestodes. VIII. theses." Experimental Parasitology. New York, 8 (4), 365-382.

Read reviews recent work on the role of carbohydrates in the nutrition of tapeworms. He deals chiefly with the effect of quantity and quality of carbohydrate on the growth, reproduction and distribution of the parasites. The significance of a requirement for carbohydrate shown by many parasites is discussed in relation to parasitism in general. W. P. Rogers

937-ROTHMAN, A. H., 1959. [Department of Pathobiology, School of Hygiene & Public Health, Johns Hopkins University, Baltimore, Md., U.S.A.] "Studies on the excystment of tapeworms." Experimental Parasitology. New York, 8 (4), 336-364.

Rothman showed that in vitro at 37 C., larvae of Hymenolepis diminuta, H. nana, H. citelli

and Oochoristica symmetrica needed bile salts for activation and excystment. Larvae of Taenia taeniaeformis everted without bile salts. The larvae of T. taeniaeformis, H. diminuta, H. citelli and H. nana needed a protease to dissolve their cysts. Treatment with pepsin increased the proportion of larvae of Hymenolepis spp. which subsequently excysted in bile salts and trypsin. The concentration of bile salts was critical for some species; if the concentration was too low invagination occurred. The significance of these results in relation to specificity of the tapeworm is discussed.

938—SARWAR, M. M., 1958. [Chadda Building, Khawja Dil Mohd Road, Lahore, West Pakistan.] 'Bionomics of eggs and miracidia of Fasciola gigantica in the Punjab region of West Pakistan.'

Agriculture Pakistan, 9 (2), 183-188.

Sarwar found that the time taken by the eggs of Fasciola gigantica to develop to miracidia varied from a week to a period of several months, depending on the variations in temperature. The eggs developed in one week during June at 30-35°C. and the period of development increased correspondingly with the decrease in temperature, no development, however, taking place during the winter at 10-13°C. The depth of water in cultures and the conditions of light and darkness did not appear to influence the rate of development of the eggs. The liberated miracidia successfully attacked Lymnaea rufescens and L. persica but a defensive mechanism in the form of exudation of mucus on the part of the snail, appeared to come into play when such species as L. luteola and Indoplanorbis exustus were attacked.

939—SAWADA, I., 1959. [Biological Laboratory, Nara Gakugei University, Nara, Japan.] "Experimental studies on the evagination of the cysticercoids of Raillietina kashiwarensis." Experimental

Parasitology. New York, 8 (4), 325-335.

Sawada examined the action of digestive enzymes on the evagination of cysticercoids of Raillietina kashiwarensis. Best results were obtained in 0.1% pancreatin at pH 7 and at 40-42°C., when 100% evaginated in 30 minutes. Trypsin had some activity, but lipase and bile salts were not effective. W. P. Rogers

940—WALLACE, H. R., 1959. [Nematology Department, Rothamsted Experimental Station, Harpenden, Herts, U.K.] "Movement of eelworms. V. Observations on Aphelenchoides ritzema-bosi (Schwartz, 1912) Steiner, 1932 on florists' chrysanthemums." Annals of Applied Biology, 47 (2),

Adults of chrysanthemum eelworm tend to move up stems of chrysanthemum plants in stationary water films. Any current of water down the stem opposes such a movement. Greatest mobility occurs in thick films of water where there is a high concentration of epidermal hairs. Movement of the eelworm through stomata and within the leaf are described. Emergence of chrysanthemum eelworm from diseased leaves has been studied and it was found that during wet weather many eelworms occur on the surface of leaves. H. R. Wallace

941—WALLACE, H. R., 1959. [Nematology Department, Rothamsted Experimental Station, Harpenden, Herts, U.K.] "The movements of eelworms in water films." Annals of Applied Biology, 47 (2), 366-370.

The methods of locomotion in water films of beet eelworm and chrysanthemum eelworm are compared. Ciné films were taken of both these species moving in water films and from the negatives the wave amplitude, length and frequency were obtained. It was found that beet eelworm achieves highest speeds in thin films while chrysanthemum eelworm moves most quickly in thick films. The form of the waves made during movement is also described. A hypothesis is put forward to explain the mechanics of eelworm movement in thin films.

H. R. Wallace

942—WANG, C. F., LIN, C. L. & CH'EN, W. H., 1959. [Fukien Medical College, Foochow.] "The mechanism of microfilarial periodicity." [Abstract.] Chinese Medical Journal. Peking, 78 (2), 171-172.

Wang et al. made microfilarial counts of blood specimens taken simultaneously from femoral artery, brachial vein and ear lobe capillaries of bancroftian filariasis patients. Periodicity was similar in all three sites but microfilariae were always more numerous in the capillaries, where they may tend to accumulate on account of slower blood flow, than in the artery or vein. Correlation was demonstrated between periodicity and size, the larger the microfilariae the more evident being their periodicity. Specimens of Mf. bancrofti appearing in the daytime were smaller than those appearing at night. Vagotropic drugs were administered to a dog infected with Dirofilaria immitis and it was found that atropine caused a decrease while pilocarpine and acetylcholine caused an increase of circulating microfilariae, probably as a result of constriction and dilatation of the pulmonary capillaries respectively. The various types of microfilarial periodicity are discussed in the light of these findings and in relation to climate and season.

J. M. Watson

943—WEISCHER, B., 1959. [Biologische Bundesanstalt, Institut für Hackfruchtkrankheiten und Nematoden-forschung, Münster (Westf.), Germany.] "Experimentelle Untersuchungen über die Wanderung von Nematoden." Nematologica, 4 (3), 172–186. [English summary p. 185.] The results of experiments investigating the distances of travel of Heterodera rostochiensis and H. schachtii are discussed and illustrated. Proximity of roots (only within 1–2 cm.) increased the hatching of cysts. The maximum distance covered by larvae during the growing season was 20 cm. Root diffusates had no influence on larvae beyond a distance of 2–3 cm., but the nematodes moved faster and further when in contact with diffusates. The direction of movement of Heterodera larvae was with the stream of liquid and in root diffusate it was faster and further than in water. Larvae of Ditylenchus dipsaci moved very much faster than those of Heterodera and the latter in turn considerably faster than those of Pratylenchus. Stem eelworms, however, showed no reaction to the direction of the current. Results suggest that spread of nematode infestations is generally slow, since after hatching larvae appear to move at first aimlessly, until movement is speeded up by root secretions. Orientated migration even in the proximity of roots occurs in the presence of host plants and adequate concentrations of effective diffusates.

H. Jacks

944—WERTEJUK, M., 1959. [Zakład Parazytologii i Chorób Inwazyjnych, Instytut Weternarii, Puławy, Poland.] "Wpływ warunków środowiskowych na larwy inwazyjne żołądkowo-jelitowych nicieni owiec." Acta Parasitologica Polonica, 7 (13/22), 315–342. [English summary pp. 341–342.] Wertejuk has studied the influence of external factors on infective larvae of gastro-intestinal worms of sheep. The longest periods of survival of larvae, placed during various seasons on to small experimental field plots, were 12 months for Ostertagia sp., 9 to 10 months for Haemonchus contortus, nine months for Trichostrongylus sp., Oesophagostomum venulosum, Chabertia ovina and Cooperia sp. and one month for Strongyloides papillosus. Larvae of all species, except S. papillosus, survived the winter under the climatic conditions prevalent in Poland (12-22% survived in 1955-56 with a minimum temperature of -28.1°C.); they exhibited considerable resistance to drying and direct sunlight, 100% of larvae living for four days in a sandy substratum in arid conditions and with temperatures up to 27-28°C. and 36% for four months in autumn; however, S. papillosus died in 24 hours on a sandy substratum and, on grass, after four days in summer and one month in autumn. Horizontal migration of larvae was limited (7 cm. in 30 days) while vertical migration depended on humidity and temperature and, to some extent, on the type of grass. G. I. Pozniak 945—WHITLOCK, J. H., TAYLOR, A. & CONWAY, D., 1959. [New York State Veterinary College, Cornell University, Ithaca, New York, U.S.A.] "A note on exsheathing mechanisms of third-stage larvae of *Haemonchus contortus*." Cornell Veterinarian, 49 (3), 421-423.

Whitlock et al. studied the exsheathment of third-stage larvae of Haemonchus contortus in rumen fluid taken at different times of the day from sheep with rumen fistulae. These sheep were given free access to hay and a feed of grain once daily. The rate of exsheathment in rumen fluid taken two hours after the grain feed was about four times that occurring in rumen fluid at other times of the day. Considering the exsheathing mechanism to be possibly related to the action of metabolic products of bacteria, the authors, using Poynter's technique [for abstract see Helm. Abs., 25, No. 25f], made tests for exsheathment with cultures of Escherichia coli. Some exsheathment occurred but higher rates were obtained when similar tests were made with anaerobic cultures of Aerobacter aerogenes, and these rates were similar to the rates occurring in rumen fluid collected after a grain feed. The authors conclude that the conditions producing exsheathment are likely to be simple and non-specific because the cultures of Aerobacter aerogenes were grown on a relatively simple synthetic medium.

H. D. Crofton

946—WRIGHT, C. A., 1959. [Department of Zoology, British Museum (Natural History), London, S.W.7.] "Host-location by trematode miracidia." Annals of Tropical Medicine and Parasitology, 53 (3), 288-292.

Wright briefly outlines the probable methods by which trematode miracidia are brought into contact with their molluscan hosts. In the species of fluke whose eggs hatch only when they are ingested by the host it is the habits of the hosts and the physical factors of the environment which bring about the contact. There are three phases in the host-finding behaviour of free-swimming miracidia, namely, first a reaction to physical stimuli which brings the larva into the host environment, then a period of random movement until the orbit of chemical attraction of the snail is encountered, and finally a stage in which there is a chemotactic response to substances secreted by the host, probably in the body-surface mucus.

C. A. Wright

947—ZABOLOTSKAYA, M. M., 1958. [Some experimental data on the activity of catalase from Dictyocaulus filaria.] Byulleten Nauchno-Tekhnicheskoi Informatsii Vsesoyuznogo Instituta Gelmintologii im. Akademika K.I. Skryabina, No. 4, pp. 39–41. [In Russian.]

The supernatant fluid from a freshly prepared aqueous homogenate of *Dictyocaulus filaria* was shown iodometrically to possess marked catalase activity. This activity decreased on storing and on dilution, only traces of activity being found in 1:10,000 dilutions. Physiological solutions in which worms had been kept for 24 hours always showed catalase activity, indicating that an ectoenzyme is present in these helminths.

G. I. Pozniak

Pathogenesis

See also Nos. 470, 495, 496, 514, 518, 529, 547, 573, 581, 590, 593, 595, 597, 602, 608, 617, 633, 638, 639, 643, 649, 662, 663, 669, 702, 711, 713, 714, 717, 723, 727, 735, 749, 845, 850, 884.

948—BAILEY, W. S., 1959. [Department of Pathology and Parasitology, School of Veterinary Medicine, Alabama Polytechnic Institute, Alabama, U.S.A.] "Spirocerca lupi from a new host, the jaguar." Journal of Parasitology, 45 (5), 510.

Spirocerca lupi (natural infection) is reported for the first time from Felis onca. Autopsy revealed characteristic lesions and perforation of the aorta in one of the affected areas. The infection appears to have been acquired in South America, whence the jaguar had been imported four days before death.

G. I. Pozniak

949—COTTELEER, C., GRÉGOIRE, C. & POUPLARD, L., 1958. [École de Médecine Vétérinaire de l'État, Cureghem-Bruxelles.] "Syntheses de pathologie parasitaire. V. Helminthes et infection." Annales de Médecine Vétérinaire, 102 (4), 242-245.

Cotteleer et al. quote certain works concerning the role of helminths as vectors of microorganisms. Special attention is drawn to the work of Stefański [for abstract see Helm. Abs., 25, No. 330d].

N. Jones

base of the legs.

950—DEWITT, W. B. & WARREN, K. S., 1959. [National Institute of Allergy and Infectious Diseases, National Institutes of Health, Public Health Service, U.S. Department of Health, Education, and Welfare, Bethesda, Maryland, U.S.A.] "Hepato-splenic schistosomiasis in mice." American

Journal of Tropical Medicine and Hygiene, 8 (4), 440-446. Mice infected with approximately 125 cercariae of Schistosoma mansoni harboured an average burden of 24 worms per animal. In the liver maximum egg density was reached at eight weeks after infection (1,765 per gm.). At ten weeks the mice showed symptoms which are normally associated with the syndrome designated hepato-splenic schistosomiasis, namely, liver enlargement with granulomatous lesions or scar tissue around deposited eggs, splenomegaly, oesophageal varices and ascites. Some mice also developed a severe anaemia. Histological examination revealed little damage to liver parenchyma. Liver function test results could be attributed to abnormal conditions produced by portal hypertension. These observations suggested that the pathogenesis of the syndrome was directly related to mechanical obstruction of the portal blood flow produced by tissue reaction associated with schistosome eggs.

J. E. D. Keeling

L. R. Richardson

951—GEBAUER, O., 1958. [Leoben, Vordernbergerstrasse 45, Steimark.] "Die Untersuchung von Schweinelebern auf das Vorkommen von Leberegeln." Wiener Tierärztliche Monatsschrift, 45 (10), 659-660.

Gebauer discusses anatomo-pathological changes caused by Fasciola hepatica in the livers of pigs. These changes, it is stated, are much less important than those caused by this fluke in the livers of cattle and sheep. In most cases adult flukes were found to be smaller than those from cattle. It is further stated that in about 3% of infected livers the flukes were found by sectioning the left part of the liver so as to cut through the bile-ducts.

N. Jones

952—HERVÉ, A., PIGANIOL, G. & TEYSSANDIER, 1957. "Les aspects endoscopiques de la bilharziose vésicale." Journal d'Urologie Médicale et Chirurgicale, 63 (12), 917-924. [Discussion p. 925.]

Hervé et al., on the basis of examination of over 100 patients with schistosomiasis of the bladder, classify the lesions as: (1) specific lesions which are sub-divided into (i) primary lesions, "semolina grain", (ii) secondary lesions, "acne grain" and (iii) tertiary lesions, bilharzioma, calcification and sclerosis; (2) non-specific lesions, which include inflammatory lesions, congestion, ecchymotic patches, ulcerations, bullous cyst; other lesions consisting of dysectasis of the cervix and black micro-granulations. The authors give a detailed description of these lesions supplemented by photomicrographs as well as the incidence of each kind of lesion among the cases examined.

N. Jones

953—HUTTON, R. F. & SOGANDARES-BERNAL, F., 1959. [Florida State Board of Conservation Marine Laboratory, Maritime Base, Bayboro Harbor, St. Petersburg, Florida, U.S.A.] "Notes on the distribution of the leech, Myzobdella lugubris Leidy, and its association with mortality of the blue crab, Callinectes sapidus Rathbun." Journal of Parasitology, 45 (4), 384, 404, 430. Hutton & Sogandares-Bernal record Myzobdella lugubris as a possible cause of mortality in the blue crab from field reports of 15 of 30 crabs having leeches sited in perforations in the dorsum of the carapace. Leeches occur also on the ventral surfaces of the carapace close to

954—LAUTENSCHLAGER, E. W., 1959. [Department of Biology, University of Virginia, U.S.A.]
"Meningeal tumors of the newt associated with trematode infection of the brain." Proceedings of the Helminthological Society of Washington, 26 (1), 11-14.

Lautenschlager examined 325 specimens of *Triturus viridescens viridescens* from Albermarle and Giles Counties. Forty were infected with *Diplostomulum* sp., the metacercariae being found unencysted and in vigorous motion in the brain case and brain. Histopathological conditions were disclosed in six of these newts. These are described and, although there is no conclusive evidence based on experimental infections, it appears probable that the tumerous conditions observed are a direct result of the presence of the trematode. There was no noticeable gross effect of parasitism on the host, all infected newts so far examined being at, or above normal size.

S. Willmott

955—LELAND, Jr., S. E., DRUDGE, J. H. & WYANT, Z. N., 1959. [Department of Animal Pathology, Kentucky Agricultural Experiment Station, Lexington, Kentucky, U.S.A.] "Studies on Trichostrongylus axei (Cobbold, 1879). III. Blood and plasma volume, total serum protein, and electrophoretic serum fractionation in infected and uninfected calves." Experimental Parasitology. New York, 8 (4), 383–412.

Leland et al. dosed calves with 5,000 to one and a half million larvae of Trichostrongylus axei and observed changes in blood volumes and proteins. Infected animals developed polycythaemic hypovolaemia which, if death did not supervene, developed into oligocythaemic hypovolaemia. The total protein and its concentration in the circulation decreased. There was also a decrease in serum albumin and globulins except α -2-globulin which remained steady or increased. Treatment with phenothiazine did not greatly affect the blood conditions but nor, apparently, did it have much effect on the worm burden.

W. P. Rogers

956—MAGALHÃES FILHO, A., 1959. [Instituto Naçional de Endemias Rurais "Centro de Pesquisas Aggeu Magalhães" Reçife, Pernambuco, Brazil.] "Pulmonary lesions in mice experimentally infected with Schistosoma mansoni." American Journal of Tropical Medicine and Hygiene, 8 (5), 527–535.

Comparative histopathological examination of control mice infected with Schistosoma mansoni showed schistosomulae in the pulmonary vessels up to the 8th day and adult worms in the mesenteric veins from the 20th day; whereas in reinfected mice considerable inflammatory changes had taken place in the lung tissue and in and around the pulmonary arterial branches; later there was increasing fibrosis and few live worms were present. The author concludes that there is retention of the schistosomulae in the pulmonary arterial branches of pre-immunized mice; that the high mortality of these parasites is probably due to some unfavourable condition of the pulmonary circulation; and that the endarteritis and arteriolitis are probably caused by dead or dying worms.

W. K. Dunscombe

957—PIGANIOL, G., HERVÉ, A. & BRUNEAU, A., 1957. "La vésiculodéférentographie chez les bilharziens." Journal d'Urologie Médicale et Chirurgicale, 63 (10/11), 773–785.

Piganiol et al. report that the first stage of schistosomiasis of the seminal vesicles was observed to have as symptoms haemospermy or involuntary ejaculations. The next stage was characterized by reactional fibrosis with three types of lesions, namely, massive hypertrophy, vesicular ectasis, vesicular atrophy or calcification. Anatomical examinations showed the presence of Schistosoma eggs in the three vesicular layers; the muscle was hypertrophied and sclerotized. The authors carried out the radiography of seminal vesicles in seven cases of schistosomiasis which had been established by other methods in the above organs. 2 c.c. of diodone at a 50% concentration was injected into the deferent ducts as contrast product. Deferent ducts were reached through a 1 mm.-1.5 mm. incision, made at the base of the scrotum. As a result of this examination lesions in the seminal vesicles and in the deferent duct bulb were observed, except in one case, where no such anomalies were found. N. Jones

Immunity

Abstracts of papers referring to the routine use of immunological techniques in diagnosis or assessment of cure will be found under the appropriate headings in the sections devoted to Medical Helminthology and Veterinary Helminthology.

See also Nos.: 619, 701, 709, 712, 716, 732, 741, 859, 868.

958—AKUSAWA, M., KOYAMA, M. & OGURI, K., 1958. [An intradermal test of canine filariasis.]

Journal of the Japanese Veterinary Medical Association, 11 (1), 32–35. [In Japanese.]

Antigen was extracted with physiological saline solution from freeze-dried Dirofilaria immitis.

The amount of the saline solution used was 10,000 to 1 to dried worm body-weight. Intradermal tests carried out with the preparation gave the following results: (i) the test proved to be specific; (ii) an immediate skin reaction occurred after the injection and faded three to four hours later without any tissue damage; (iii) dogs without microfilariae in the blood but with prominent clinical symptoms showed a strong positive skin reaction.

Y. Yamao

959—HADANO, N., 1959. [Department of Parasitology, Gifu Prefectural Medical School, Gifu, Japan.] [Studies on tapeworm antigens. I.] Acta Scholae Medicinalis in Gifu, 7 (3), 808–821.

From one gramme of the dried, powdered bodies of adult *Diphyllobothrium mansoni* and *Moniezia* sp., the author extracted the antigens in physiological saline solution, with which he then immunized rabbits and produced antibodies. The antigens of *D. mansoni* and *Moniezia* sp. seemed closely related. The antigen of the one was positive to the antibody of the other, although their immune value in the precipitation test dropped to 1:8 to 1:100 of the originals. On the other hand, the antibody value was sometimes elevated in the same cross reaction between the two species. Antiserum obtained from the cestode antigens reacted negatively to trematode or nematode antigens in the precipitation reaction.

Y. Yamao

960—HATCH, C., 1959. [Veterinary College of Ireland, Ballsbridge, Dublin.] "Some notes on immunity to parasites." Irish Veterinary Journal, 13 (4), 62–66.

This article, which is directed to veterinary practitioners, mentions the various types of immunity to parasites and gives examples of some of the practical uses to which a knowledge of these immunities can be put.

C. Hatch

961—HURLEY, F. J., 1959. [Department of Biology, Catholic University of America, Washington D.C., U.S.A.] "Immunization threshold in laboratory rats given a small initial infection of Nippostrongylus muris." Proceedings of the Helminthological Society of Washington, 26 (2), 91–96. Four experiments were performed to investigate whether or no an acquired immunity developed in a rat after a small initial subcutaneous dose of Nippostrongylus muris larvae. Rats which were infected with as few as 20 larvae showed evidence of acquired immunity against superinfection with 20 and 100 larvae given 38 days after the initial infection. The daily faecal egg count and the worm counts at autopsy were used to demonstrate this. The previously infected animals had, on superinfection, a delayed onset of maximum egg count and a reduction in the number of eggs produced. These experiments indicated that there is no threshold dosage for development of acquired immunity in laboratory rats to Nippostrongylus muris. It was found that the adult worms resulting from these minimal initial and superinfection doses remained in the intestine and produced eggs longer than those resulting from larger doses. Similar phenomena may account for the frequent occurrence and persistence of this parasite in the wild rat Rattus norvegicus.

K. Heath

962—RODRIGUEZ-MOLINA, R., LICHTENBERG, F., OLIVER-GONZÁLEZ, J. & SALA, A. R. DE, 1959. [General Medical Research Laboratory, Veterans Administration, San Patricio Hospital, San Juan, Puerto Rico.] "Studies on immunity to Schistosoma mansoni. II. The circumoval precipitin reaction to S. mansoni in mice treated with stibophen." American Journal of Tropical Medicine and Hygiene, 8 (5), 565-569.

Rodriguez-Molina et al. describe experiments to ascertain whether the circumoval precipitin reaction becomes negative when Schistosoma mansoni infection becomes inactive. One group of infected mice were treated with intramuscular stibophen, at a dosage of 10·2 mg. per kg., starting on the 70th day after exposure and administered daily for five days per week for periods up to 280 days. All the treated animals and controls were killed and autopsied at regular intervals. In the controls the test became positive 65-70 days after infection; in the treated animals the test remained positive up to 210 days after treatment began and was negative from the 220th day onwards. Embryonated and intact eggs disappeared from the tissues of treated animals after 210 days; inflammation subsided and the liver structure improved. The liver and intestine of the untreated mice which lived up to 210 days after exposure to cercariae contained live eggs. The authors consider that in treated mice the test becomes negative about 210 days after the commencement of treatment, coinciding with the progressive disappearance of ova and change in the tissue reaction from an inflammatory to a cicatricial type. They suggest that the source of the antigen responsible for the circumoval precipitation phenomenon is the contents of the viable schistosome egg. The clinical

application of these findings is discussed. It is pointed out that the test may be of value in determining extinction of infection as a result of therapy or due to other factors.

W. K. Dunscombe

963—TAKAHASHI, T., 1959. [Department of Parasitology, Gifu Prefectural Medical School, Gifu, Japan.] [Studies on pinworm immunity. III. The antigen analysis.] Acta Scholae Medicinalis in Gifu, 7 (3), 790-807. [In Japanese: English summary p. 790.]

After acidification and heat treatment, rat oxyurid [?Syphacia obvelata] antigens showed a fall in antigenicity. The precipitation reaction, using antiserum obtained from immunization by whole worm body extracts against the metabolites of rat oxyurid, was found to be negative. This was probably due to the low titre of the antiserum. Using the same antiserum, the T.M. reaction in human enterobiasis was also proved to be negative.

Y. Yamao

Anthelmintics

See also Nos. 431, 440, 444, 452, 455, 459, 460, 467, 469, 472, 481, 486, 487, 492, 497, 502, 505, 507, 508, 515, 521, 522, 524, 530, 534, 536, 545, 551, 555, 561, 563, 566, 574, 575, 577, 578, 580, 583, 587, 589, 591, 592, 594, 598, 599, 600, 602, 603, 605, 606, 613, 614, 624, 629, 633, 634, 638, 642, 646, 647, 648, 653, 654, 657, 661, 669, 677, 686, 687.

964—BLANK, H., WINTER, M. W. & BECK, J. W., 1959. [Division of Dermatology of the Department of Medicine, University of Miami School of Medicine, Miami, Florida, U.S.A.] "The effects of chemical and physical agents on filariform larvae of Ancylostoma braziliense." American Journal of Tropical Medicine and Hygiene, 8 (4), 401–404.

Blank et al. have tested 183 compounds against the filariform larvae of Ancylostoma braziliense in vitro. 0·3 ml. of diluted drug (in water or other solvent) in concentrations of 10 to 5,000 mg. per ml. were added to batches of 30 sterilized larvae and their lethal effect observed at hourly intervals and after 24 hours. From among the organic phosphates, Co-ral (O,O-diethyl O-(3-chloro-4-methyl-7-coumarinyl) phosphorothioate and malathion showed some activity which may prove of practical value in the treatment of creeping eruption in man and in the disinfection of soil. All larvae were dead after 24 hours in 50 and 100 mg. per ml. Co-ral and after 12 hours in 500 and 1,000 mg. per ml. malathion. Of the chlorinated hydrocarbons, phenothiazine derivatives and nematicides respectively Dilan, chlorpromazine and Vapam showed similar activity. The results are tabulated and commonly used antibiotics and other compounds which proved ineffective are listed.

G. I. Pozniak

965—DREŽANČIĆ, I., 1958. "Korištenje refleksa zatvaranja jednjakova žlijeba kod aplikacije anthelmintika." Veterinarski Glasnik, 12 (11), 928–929.

Drežančić describes briefly the use of sodium bicarbonate and copper sulphate solution in causing the sulcus oesophagicus closing reflex in ruminants. It is suggested that this reflex should be used while trying new anthelmintics.

N. Jones

966—ITO, K., 1958. [Influences of various drugs on larvae of hookworm in vitro and the prevention of its cutaneous infection with iodine tincture.] Journal of the Yonago Medical Association, 9 (6), 1122–1133. [In Japanese.]

Thirty-four chemical compounds were examined for their lethal effect on hookworm larvae. Iodine derivatives were most effective, especially tincture of iodine and Lugol's solution. Penetration by larvae was completely prevented by painting the skin of the experimental animals (mice and dogs) with diluted tincture of iodine.

Y. Yamao

967—LE, W. J., YANG, J. Y. & SHANG, Y. C., 1959. [Institute of Parasitic Diseases, Chinese Academy of Medical Sciences, Shanghai.] [Studies on the experimental therapy of schistosomiasis japonica. XI. The correlation between concentration of solution and curative effect of potassium antimonyl tartrate.] Acta Pharmaceutica Sinica, 7 (1), 51-52. [In Chinese: English summary p. 52.]

This paper deals with an experiment to ascertain the correlation between schistosomicidal effect and the concentration of the solution of potassium antimonyl tartrate. Investigation

was made in experimentally infected rabbits treated intravenously with the same dosage of potassium antimonyl tartrate in three different concentrations. The average number of worms recovered from groups of animals receiving 0.5%, 1% and 2% solutions was 26.9, 30.3 and 41.1 respectively while that from untreated animals was 104. It seems that the curative effect of potassium antimonyl tartrate is inversely related to the concentration of solution used. L. S. Yeh

968—NAGATY, H. F., RIFAAT, M. A. & MORSY, T. A., 1959. [Department of Parasitology, Faculty of Medicine, Ein-Shams University, Cairo.] "The latex of Calotropis procera (family: Asclepia-deceae [Asclepiadaceae]), a new substance having an ascaricidal effect in-vitro." Journal of the Egyptian Medical Association, 42 (10), 563-566.

Nagaty et al. found that the latex of Calotropis procera had an ascaricidal effect in vitro comparable to that of the latex of Ficus carica and Papaya carica. No toxic effects were observed in a rat which received 6 ml. per kg. body-weight by stomach tube. The ascaricidal effect is considered to be enzymatic in nature.

J. M. Watson

969—OELKERS, H. A., 1958. [Pharmakologisches Laboratorium, C. F. Asche u. Co. A. G., Hamburg-Altona, West Germany.] "Zur Chemotherapie der natürlichen Oxyuren-Infektion der Maus." Arzneimittel-Forschung, 8 (11), 717–719. [English summary p. 719.]

Oelkers discusses Boecker & Erhard's work [for abstract see Helm. Abs. 24, No. 463b] but maintains that Aspiculuris tetraptera infection in mice is suitable for the testing of drugs against Enterobius provided that a cure rate greater than 50% produced by a well tolerated dosage be taken as the indication of efficacy. Using small repeated doses he has tested again the compounds tried by these authors and confirms their results. The most effective was piperazine hydrate (five doses of 70 mg. per kg. body-weight given over three days). The compound Vermella, which was tested additionally, gave almost equally satisfactory results.

970—PANASYUK, D. I. & YAKOVLEV, S. A., 1959. [Phenothiazine, a highly effective drug in the control of *Dictyocaulus* and other strongylate infections in sheep.] Veterinariya, 36 (9), 27–29. [In Russian.]

Literature on the use of phenothiazine against helminths and particularly *Dictyocaulus* in sheep in Russia is briefly reviewed. The regular application of phenothiazine led to a six-fold reduction in dictyocauliasis between 1951 and 1958.

G. I. Pozniak

971—PELÁEZ, D., JARA, F. DE LA & PÉREZ-SOLÓRZANO, S., 1958. [Del Laboratorio de Parastiología, Escuela Nacional de Ciencias Biológicas, Instituto Politécnico Nacional, México, D.F.1 "Observaciones sobre la actividad enzimática y el poder antihelmíntico de látex recientes y conservados de Ficus glabrata de México." Acta Científica Potosina. Mexico, 2 (2), 149–166. Peláez et al. studied the enzymatic activity of Ficus glabrata latex by means of coagulation and digestion tests. Three specimens of the latex had been stabilized with sodium benzoate while to a fourth specimen ferri-ammonium citrate and vanilla tincture had been added. After five-and-a-half months in storage, the rate of coagulation and digestion of fresh cow's milk was higher for the first fraction (L.A.) of the latex, which had been stored in ambercoloured glass than for the other fractions, stored in colourless glass, although in all cases efficacy had been appreciably reduced through storage. 14 persons infected with Trichuris trichiura were given 30 ml. to 60 ml. of the L.A. fraction in two divided doses at four to six hours' interval. 57.1% of the patients treated were freed from T. trichiura infection. In 21.4% eggs of the parasite reappeared in the third week after treatment. One patient, who also harboured Ascaris lumbricoides, passed three worms with small cuticular lesions; these died after two hours but Ascaris eggs reappeared within two to three weeks. Hymenolepis nana infection was eliminated by the treatment. The drug was perfectly well tolerated. N. Jones

972-SUN, Q. X., CHEN, W. Z., LI, H. Y. & TING, K. S., 1959. [Institute of Materia Medica, Academia Sinica, Shanghai, China.] [Studies on antibilharzial drugs. XV. Effect of tartar emetic on the cerebral blood flow in rabbits.] Acta Physiologica Sinica, 23 (1), 29-36. [In Chinese: English

The arterial blood pressure (BP), the cerebral blood flow (CBF) and the cerebral vascular arterial blood pressure (BP), the cerebral blood flow (CBF) and the cerebral vascular injection resistance (CVR) of 84 normal rabbits were measured for comparison. Intravenous injection of a 4-6 mg. per kg. body-weight dose of tartar emetic or three days' intensive treatment (4 mg. per kg. b.i.d.) had no measureable influence on the cerebral circulation. Intravenous and intraperitoneal administration of 40 mg. per kg. showed a decrease of cerebral blood flow and increase of cerebral vascular resistance. The English summary states "Therapeutic doses of tartar emetic rendered little change in the cerebral circulation, while the toxic doses yielded a reduction of CBF and a constriction of the intracranial vessels. Before the cardiac arrhythmias occurred, the CBF had been diminishing and the CVR enhancing. At the time that the cerebral circulation was in a state of very low BP, very slow CBF and very high CVR, the electro-cardiogram also revealed arrhythmias. Intracarotid injections of small doses (below $4\mu g$.) of tartar emetic did not modify the cerebral circulation, whereas a large dose (0.8 mg.) induced a striking rise of CBF and a precipitous drop of CVR, lasting a few minutes. Intravenous administration of sodium dimercaptosuccinate 0.25 g/kg, conferred no marked action, but a dose twice the amount brought about cardiac arrhythmia together with a dwindling CBF and an augmenting CVR. Intravenous injection of atropine sulphate 1 mg/kg. yielded a tendency to decreasing CBF and increasing CVR, while 2 mg/kg, produced an evidently high CBF accompanied by a low CVR. Intracarotid injections of either sodium dimercaptosuccinate or atropine elicited a prompt rise of CBF and a fall of CVR." L. S. Yeh

973—WARDA, L., 1959. [Zakład Parazitologii, Instytut Medycyny Morskiej, Gdańsk, Poland.] "Działanie niektórych preparatów piperazynowych na jelitowe postacie włośni (Trichinella spiralis)."

Wiadomości Parazytologiczne, 5 (2/3), 299-306. [English summary p. 306.] Warda investigated the action of piperazine compounds on Trichinella spiralis. experiments showed that the most effective piperazine compound was the pure hydrate; the others tested were the hydrate in hydrochloric acid medium, the hydrate neutralized by citric acid, and the adipate. In mice, these compounds in doses of 150 to 600 mg. per kg. body-weight reduced the number of males in the intestine by 81% to 97% and of females by 24% to 56%. A preliminary gastric intubation of magnesium oxide and dosing not earlier than eight days after initial infection led to the best results. To investigate the effect of dosing during the intestinal stage of infection on the number of larvae subsequently present in the diaphragm, experimentally infected white mice were given by gastric intubation 300 mg. per kg. body-weight of the adipate or the neutralized hydrate on six consecutive days. The mice were autopsied 60 days after infection. The largest reduction of larvae (58·1%) was obtained in mice which had received a preliminary dose of 20 mg. of magnesium oxide per animal and which had been dosed on the 8th to 13th day of infection. A single injection of 300 mg. per kg. directly into the small intestine on the 6th day reduced the number of larvae by 32·1%. G. I. Pozniak

974—WHITTEN, L. K., 1958. [Wallaceville Animal Research Station, Wellington, New Zealand.] "Fine particle phenothiazine." Sheepfarming Annual. Massey Agricultural College, N.Z., Year 1958, pp. 223-228.

An account is given of work previously noted [for abstracts see Helm. Abs., 25, No. 121a and 26, No. 127a] and some more recent trials confirming that particle size is an important factor influencing the efficiency of phenothiazine against the nematode parasites of sheep. The efficiency was high against Haemonchus contortus, even with coarse material, but with Trichostrongylus spp. the efficiency improved with increasing fineness. The finest sample available was one in which all particles were less than 1μ in diameter.

Economic Aspects

See also Nos.: 587, 621, 665, 765.

975-ALI, S. M., 1957. "Man and his animals." Proceedings of the Pakistan Science Conference,

9th (1957), Part II, pp. 87-96.

Ali stressed the importance of the inter-relationship between the human and animal parasites in the realm of public health and economic welfare of society. As an illustration, he quoted an infection with Cysticercus bovis of 12% of the cows on some farms in California which had resulted in a financial loss in meat to the value of \$35,000,000. M. M. Sarwar

976—GRANVILLE, A., GRÉGOIRE, C. & DEBERDT, P., 1958. [École de Médecine Vétérinaire de l'État, Cureghem-Bruxelles.] "Rapport présenté a la Société des Directeurs d'Abattoire, le 15 septembre 1957." Annales de Médecine Vétérinaire, 102 (3), 194–201.

Granville et al., in their report on cysticerciasis in cattle, briefly review the life-cycle of Taenia saginata and then discuss its control. It is estimated that in Belgium 0.5% of carcasses are depreciated through refrigeration for control of cysticerciasis. If the depreciation is 45% of the normal value of the carcass, the total annual losses for the whole of the country would be 25,000,000 Belgian francs. The authors also quote statistical data concerning similar losses in Germany.

History

No relevant abstracts in this issue

Biography

No relevant abstracts in this issue

Hyperparasitism

See also No. 726.

977-BUTTNER, A. & SALINÉSI, T. M., 1959. [Institut de Parasitologie, Faculté de Médecine, Paris.] "Sur un sporozoaire parasite de Schistosoma bovis (Trematoda, Schistosomatidae)." Comptes Rendus des Séances de la Société de Biologie, 153 (7), 1185-1189.

Buttner & Salinési found a considerable number of specimens of a Corsican strain of Schistosoma bovis, recovered from laboratory-infected rabbits, to be heavily infected with a sporozoan parasite. They describe and figure the stages observed, namely, plasmodial masses and spores which occurred free in the intestinal lumen of the worm, and rounded cystic structures, often pigmented, which were embedded in the parenchyma. No possible stages of the hyperparasite were found in the rabbit hosts. That the hyperinfection also occurs in nature was proved by the recovery of similar organisms from specimens of S. bovis from Nioro (Sudan) sheep. Possible sources and routes of infection of the schistosomes are discussed, and after reviewing the stages of the hyperparasite which they observed the authors conclude that it may be related either to the genus Urosporidium or to the genus Haplosporidium. J. M. Watson

Evolution

No relevant abstracts in this issue

Miscellaneous

978—BABIĆ, I., 1958. "Osnovni podaci o Svesaveznom Institutu Helmintologije u Moskvi." Veterinarski Glasnik, 12 (12), 1041–1043.

Babić briefly describes the work of the Soviet Helminthological Institute in Moscow.

N. Jones

979—GRABDA, E., 1959. [Zakład Chorób Ryb, Wyższa Szkoła Rolnicza, Olsztyn, Poland.] "Przegląd dorobku polskiej parazytologii ogólnej i rybackiej za ostatnie dwulecie (1956–1958)." Wiadomości Parazytologiczne, 5 (2/3), 141–156. [Also in English pp. 156–167.]

This report summarizes the parasitological investigations made during the past two years in Poland, other than those of medical or veterinary interest. It includes papers on such general aspects of parasitology as host-parasite relationships, ecological influences, faunistic studies, systematics, and work on fish parasites.

G. I. Pozniak

980—KOZAR, Z., 1959. [Zakład Parazitologii, Polska Akademia Nauk, Warszawa, Poland.] "Zagadnienie antropozoonoz pasożytniczych." Wiadomości Parazytologiczne, 5 (2/3), 175–198. [Also in English pp. 199–211.] [Discussion pp. 315–320.]

Kozar believes that the concept "anthropozoonoses" should be more restricted and, in addition to the source of infection, should also take into consideration the degree of host specificity. Accordingly, he defines an anthropozoonosis as a form of parasitic invasion in which the parasite shows almost equal specificity toward the human and animal host. Anthropozoonoses may be looked upon as a stage in the evolutionary development of parasites. Consequently, Kozar distinguishes the following three groups of parasites: (i) zooparasites—species specific to animals, which are divided into (a) absolute zooparasites (strictly specific to animals) and (b) relative zooparasites or relative anthropozoonoses (those which may be exceptionally found in man); (ii) anthropozooparasites—species occurring in man and animals, i.e. anthropozoonoses proper; and (iii) anthroparasites—species completely or almost completely specific to man, which are divided into (a) relative anthroparasites (species specific to man although they may also occur in animals) and (b) absolute anthroparasites (occurring in man only). He then attempts to assign the parasites of man (helminths and protozoa) to these groups.

G. I. Pozniak

981—SWIERSTRA, D., 1958. [Rijksuniversiteit, Utrecht.] "De parasitaire ziekte. Een gecompliceerd probleem." Tijdschrift voor Diergeneeskunde, 83 (23), 1187-1198.

For his Address, given at his official acceptance of a Professorship in the State University of Utrecht, Swierstra chose the subject "Parasitic disease, a complicated problem". After introductory remarks on the bionomics of helminth larvae as influenced by climatic conditions, he passes on to the main theme of his lecture—immunity to parasitic infections. He gives a review of some of the factors involved in parasitic disease to demonstrate that, in its course, so many separate features exert their influence at different stages. The result is that there are a great many difficulties in the way of making a correct diagnosis based on obtaining an impression of the number of parasites present. Among the factors mentioned are the checking of the development of larvae in the host by the presence of adults; the "self-cure" phenomenon involving the sudden extirpation of adults following re-infection with a large number of larvae, which by some is attributed to the production of histamine and by others to the production of a localized oxygen shortage in the gut; and the influence of cobalt and its association with vitamin B₁₂ production. Reference to many authors is made throughout the paper. Swierstra is forced to the conclusion already reached by practitioners that it is, as yet, still an academic question whether some parasitic diseases are primarily the direct result of the action of the parasite or chiefly a nutritional imbalance. W. M. Fitzsimmons

982—ULMER, M. J., 1959. [Department of Zoology and Entomology, Iowa State College, Ames, Iowa, U.S.A.] "Studies on Spirorchis haematobium (Stunkard, 1922) Price, 1934 (Trematoda: Spirorchiidae) in the definitive host." Transactions of the American Microscopical Society, 78 (1), 81–89.

Ulmer presents a very detailed study of Spirorchis haematobium. Of a total of 67 turtles examined, seven Chrysemys picta belli harboured S. haematobium (a new host record), two harboured S. elegans and one had a mixed infection. Two Chelydra serpentina were infected with S. haematobium. Although much reduced, a Mehlis' gland is present in S. haematobium and the seminal vesicle consists of a large, conspicuous, pyriform external and a smaller internal seminal vesicle. The conspicuous coiled vesicle near the posterior end, which has been observed by many investigators, is associated with the excretory and not the lymphatic system. Although in C. serpentina the spirorchiids were situated within the mesenteric vessels or inside the ventricle of the heart, in Chrysemys picta belli they occurred only occasionally within the mesenteric vessels, being far more frequently found in the oesophageal region embedded in the submucosa and, more rarely, in the connective tissue surrounding the oesophagus. They must therefore be regarded as occasional tissue invaders.

NEWS AND NOTES

Eighth International Congress of Hydatid Disease

THE EIGHTH INTERNATIONAL CONGRESS of Hydatid Disease will meet in Rome from 15th to 17th September and then in Sassari from 18th to 19th September, 1960. The President of the Congress is Professor Pietro Valdoni, and the General Secretary is Professor L. Imperati. Correspondence should be addressed to Clinica Chirurgica, Policlinico Umberto 1, Rome.

Ancylostomiasis in the Eastern Mediterranean Region

AT THE NINTH Session of the WHO Regional Committee for the Eastern Mediterranean it was emphasized, in the course of technical discussions, that ancylostomiasis is one of the most important parasitic diseases in the region. It was recommended that a survey of the basic factors involved in the epidemiology of the disease should be carried out; that steps should be taken for the improvement of sanitation in the affected areas and for the development of safe remedies for mass treatment; and that measures to combat the disease should be included in national schemes for economic development.

Commonwealth Agricultural Bureaux Review Conference 1960

THE QUINQUENNIAL REVIEW CONFERENCE will be held from 24th August to 29th September in the Church House, Westminster, London, S.W.1

After the opening plenary session, visits will be paid to the Institute of Entomology, the Mycological Institute and the Bureaux. The Conference will then reassemble on Tuesday, 20th September at Church House for committee work and discussion.

The delegates will inspect the Bureau of Helminthology on Wednesday, 14th September.

Register of Helminthologists

ONE HUNDRED AND TWENTY-ONE REPLIES have been received so far to the questionnaire form issued with *Helminthological Abstracts*, Volume 27, Part 1.

Research in Veterinary Science

THE FIRST NUMBER of the new quarterly journal Research in Veterinary Science, published by Blackwell Scientific Publications Ltd., on behalf of the British Veterinary Association, appeared in January, 1960. It included a paper by

J. H. Rose on three gastro-intestinal nematodes recently recorded from British cattle.

The editors plan to make the scope of the journal international, so that contributions in English from any country will be welcomed. Manuscripts embodying original contributions to knowledge of the health and disease of animals should be sent to the Scientific Editor, Research in Veterinary Science, 7, Mansfield Street, London, W.1.

Protection Against Livestock and Poultry Diseases

A BILL to provide greater protection against the introduction and dissemination of diseases of livestock and poultry is under consideration by the Eighty-sixth Session of the United States Congress.

Parasitologists' Seal

THE AMERICAN SOCIETY OF PARASITOLOGISTS has adopted an official seal designed by Dr. Justus Mueller of the State University of New York. The design embodies a stylized transfer section of a nematode oesophagus, superimposed upon a flatworm sucker. In the three angles stand an anopheline egg, an Entamoeba histolytica cyst, and a planorbid snail. The design can also be interpreted as representing a central radiant sun with peripheral raindrops, indicating the two principal climatic factors affecting the ecology and distribution of parasites. The sun and its rays also form the symbol for radioactivity, so including a reference to the more modern approaches to parasite biochemistry and physiology.

Closure of Hicksville Research Station

THE NEMATOLOGY SECTION of the Crops Research Division of the U.S. Department of Agriculture has closed the research field station at Hicksville, Long Island. Cornell University, co-operator at Hicksville, will maintain its research programme on golden nematodes of potatoes.

Course in Medical Malacology

A Course designed to cover the taxonomy, host-parasite relationships, biology, ecology and control of snails of medical importance is to be conducted by Dr. Frederico S. Barbosa at the Fundação Gonçalo Moniz in Salvador, Bahia, Brazil from the 4th to 23rd July, 1960. Six fellowships for this course are being offered by the Campanha Nacional de Aperfeiçoamento de Pessoal de Nivel Superior. Further information can be obtained by writing to Dr. Barbosa, Caixa Postal 459, Recife, Brazil.

Institut für Hackfruchtkrankheiten und Nematodenforschung der Biologischen Bundesanstalt für Land- und Forstwirtschaft

IN DECEMBER, 1959 the Institute moved to a new building. The new address is Münster/

Westf., Toppheideweg 88. In its new quarters the Institute has sufficient space to accommodate guest workers who wish to carry out nematological investigations. Applications, which will be dealt with promptly, should be directed to Dr. H. Goffart at the above address.

REPORTS OF MEETINGS

American Society of Tropical Medicine

THE EIGHTH ANNUAL MEETING OF THE SOCIETY was held from 28th to 31st October, 1959 in Indianapolis. Among the 74 interesting and provocative papers presented were 30 helminthological contributions. The Ninth Annual Meeting of the Society will be held in Los Angeles, California, 2nd to 5th November, 1960. This will be a joint meeting with the American Society of Parasitologists.

Bureau of Biological Research

THE SIXTEENTH ANNUAL CONFERENCE OF THE BUREAU was held at Rutgers, the State University, on 29th and 30th January, 1960. Among the speakers was Dr. Theodor von Brand, who writes the review article in this issue of *Helminthological Abstracts*. Topics discussed included schistosomes, enzymes, physiology of hatching and larval exsheathment in nematodes, and excretory mechanisms and excretory products of nematodes.

Nematode Symposium

A Symposium entitled "Nematology in the Tropical and Sub-tropical Zones of the Western Hemisphere" was held on 2nd December, 1959, as part of the proceedings at the Nineteenth Annual Meeting of the Soil and Crop Science Society of Florida at the University of Florida, Gainesville.

PROGRAMMES AND PERSONNEL

Sir Geoffrey Nye

COMMONWEALTH AGRICULTURAL BUREAUX LIAISON OFFICER for the Colonial Territories and Agricultural Advisor to the Secretary of State for the Colonies, was created a Knight Commander of St. Michael and St. George in the New Year Honours List.

Dr. J. S. Du Plessis

HAS BEEN APPOINTED Commonwealth Agricultural Bureaux Liaison Officer for the Union of South Africa in place of Dr. P. D. Henning.

Recent Overseas Visitors to the Bureau

INCLUDED DR. W. C. CLARK, Entomology Division, Department of Scientific and Industrial Research, Nelson, New Zealand; and Mr. P. F. Byrne, Veterinary Department, British Guiana.

Dr. J. B. Goodey

OF THE NEMATOLOGY DEPARTMENT, Rothamsted Experimental Station, has been appointed to the Editorial Board of *Nematologica*.

Dr. George Macdonald

DIRECTOR, Ross Institute, London School of Hygiene and Tropical Medicine, who has been extending to schistosomiasis the type of epidemiological approach for which he is already well known in the field of malaria, recently visited various countries in Africa to investigate the schistosomiasis position there on behalf of WHO. He was particularly concerned with the significance of the disease in relation to the general health pattern of the population, the form of preliminary survey required as a basis for effective control, and research needs in this connection.

Dr. E. L. Taylor

Who Retired on the age limit in July, 1959, from the position of Deputy Director of Veterinary Investigation Services, Central Veterinary Laboratory, (Ministry of Agriculture, Fisheries & Food), Weybridge, Surrey, has been reappointed as a research officer and has thus relinquished his administrative duties for a return to active laboratory work.

Mr. F. St. George Sleith

OF THE VETERINARY COLLEGE OF IRELAND and Official Correspondent of the Commonwealth Bureau of Helminthology for the Republic of Ireland, has been appointed to the Chair of

Clinical Veterinary Sciences in Trinity College, Dublin.

Dr. L. R. Faulkner

OF THE UNIVERSITY OF WISCONSIN is investigating nematode disorders of plants in Washington State from a base at the Irrigation Experiment Station, Prosser, Washington.

Dr. Morgan Golden

FORMERLY engaged in investigating nematode diseases of sugar-beet in California, is now developing a taxonomic programme to aid in the identification of plant-parasitic nematodes from his new base in Beltsville, Md.

Dr. L. R. Jenkins

PROJECT LEADER in Nematology at the University of Maryland since 1954 has joined the staff of Rutgers University as Associate Professor of Nematology.

Dr. John G. Oughton

MEDICAL ZOOLOGIST from the University of Toronto, Canada, has joined a WHO team which is planning schistosomiasis control programmes in the Middle East. After a short assignment in Iraq he will go on to spend two

years in Iran to study the ecology and advise on the control of the vector snails.

Dr. R. A. Rhode

OF THE UNIVERSITY OF MARYLAND has joined the staff of the University of Massachusetts as Assistant Professor of Plant Pathology in the field of nematology.

Dr. Marcel Roche

DIRECTOR, Venezuelan Institute of Scientific Research, Caracas, in an address to the October meeting of the Tropical Medicine Association of Washington, described the remarkable work being done in his Institute on the pathogenicity of hookworms.

Dr. B. Schwartz

RETIRED in November, 1959, from the position of Principal Parasitologist, Animal Disease and Parasite Research Division, Agricultural Research Service, U.S. Department of Agriculture, at Beltsville, Maryland. He is preparing to attend the International Conference on Trichineliasis in Warsaw, Poland in September and is arranging a programme for a Symposium on Parasitology for the 10th Pacific Science Conference at Honolulu, Hawaii, in 1961. He will be the convener of this symposium. Dr. Schwartz's successor has not yet been named.

MOVEMENTS OF HELMINTHOLOGISTS

HELMINTHOLOGISTS are invited to notify the Editor of any change of appointment or temporary movements from their normal station on leave or for other reasons, if such movements are likely to be of interest to their fellow helminthologists. At least three months advance notice is desirable.

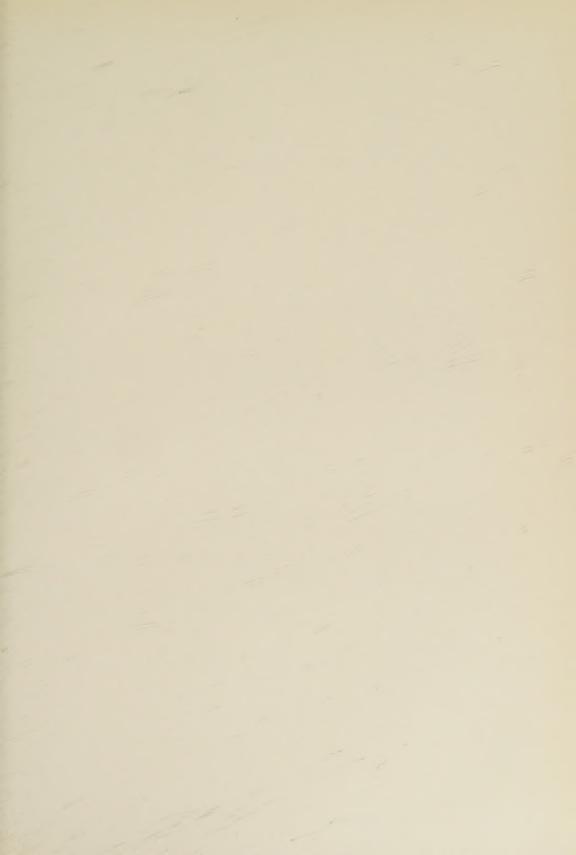
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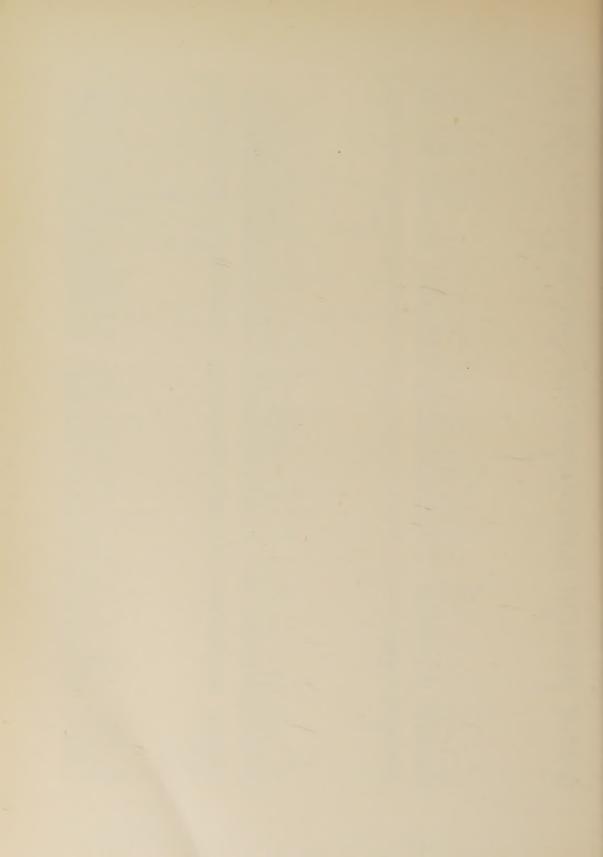
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